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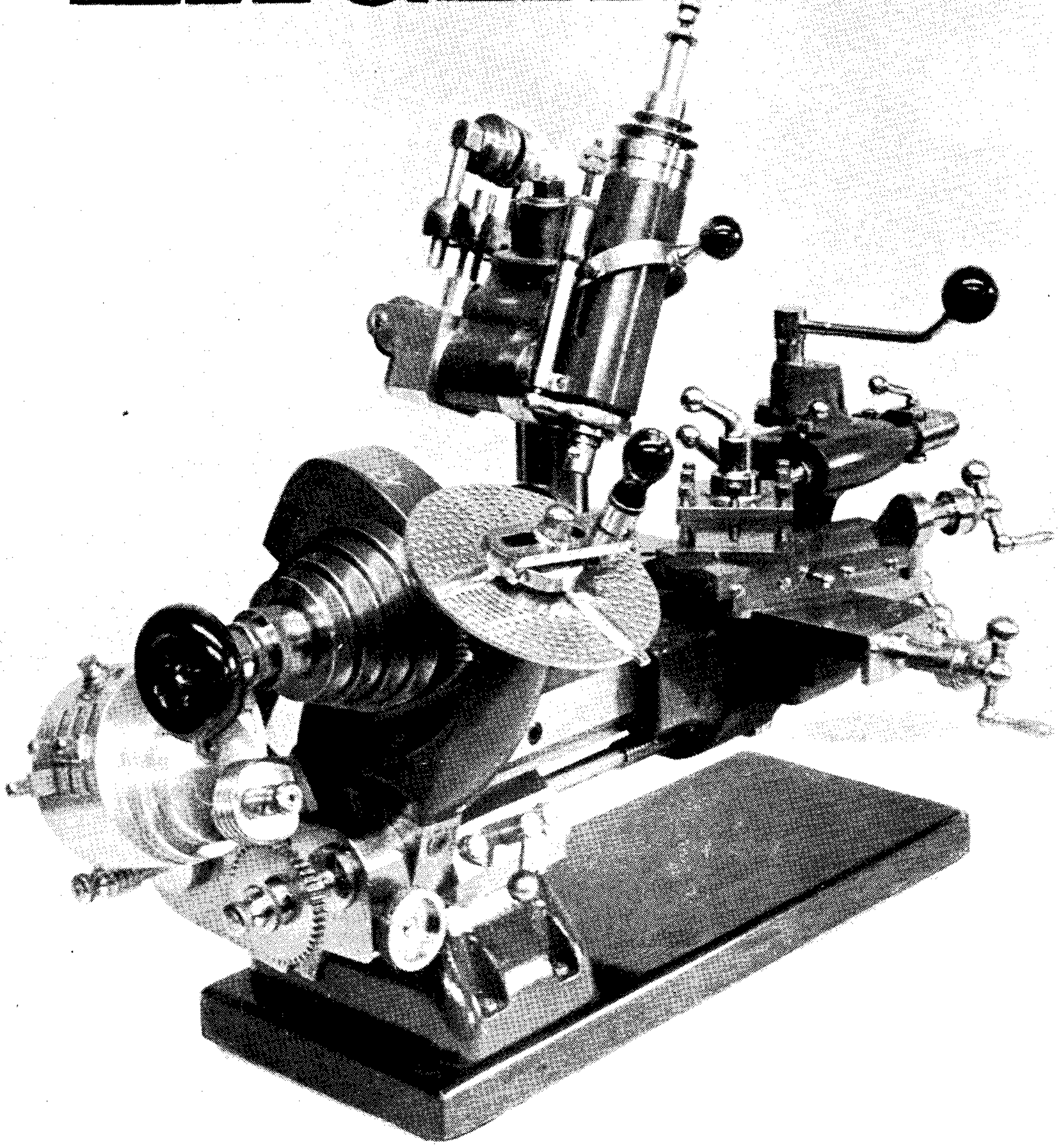
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

27TH SEPTEMBER 1951 VOL. 105 NO. 2627

SMOKE RINGS

More Success for British Boats

● WE HAVE received from Mr. G. H. Stone another postcard, this time from Paris, advising us that at the French International races, his *Lady Babs* won the 10-c.c. class; Mr. E. Clark won the 30-c.c. class, with his *Gordon III*, and Mr. K. Williams was second with *Faro*. The speeds achieved were 75, 62.5 and 57.75 m.p.h., respectively. Bravo! to all of them.

An Old Reader Remembers

● REFERRING TO our recent reference to the gas turbine and the mention of it in THE MODEL ENGINEER for February 9th, 1905, Mr. John H. Bryan, of Utah, U.S.A., writes:—

"Seeing in a recent issue of the 'M.E.' in the Salt Lake Public Library a reference to how long ago your paper first made reference to the gas turbine, I think if you refer to the issue of Thursday, November 9th, 1905, you will find such a reference, which, though ten months or so later than the date mentioned in the recent issue above referred to, is nevertheless quite a few years ago. That was the first copy of the 'M.E.' purchased by myself; I was then working in the photograph department of the Brush Electrical Engineering Co., Falcon Works, Loughborough, awaiting my turn to get into the 'shops' as an apprentice, which turn came about three weeks later, December, 1905. How often I wonder what has become of all the old workmates of that day, Freddie Pearson, marker-off in the Universal shop, to whom I introduced the 'M.E.' (and whose young son referred to it as 'the Puffer Book'), Jackie Flinders, of the shaping and planing gang, George Hewitt, of the milling machines, Bill Swann, of the fitters, and Ernest Swann, shop foreman.

"Then later at the Elswick Works of Messrs. Armstrong, Whitworth & Co., Newcastle-on-Tyne, with Harry Gordon, Jimmy Weir, Mr. Seymour, manager, etc., of No. 39B shop.

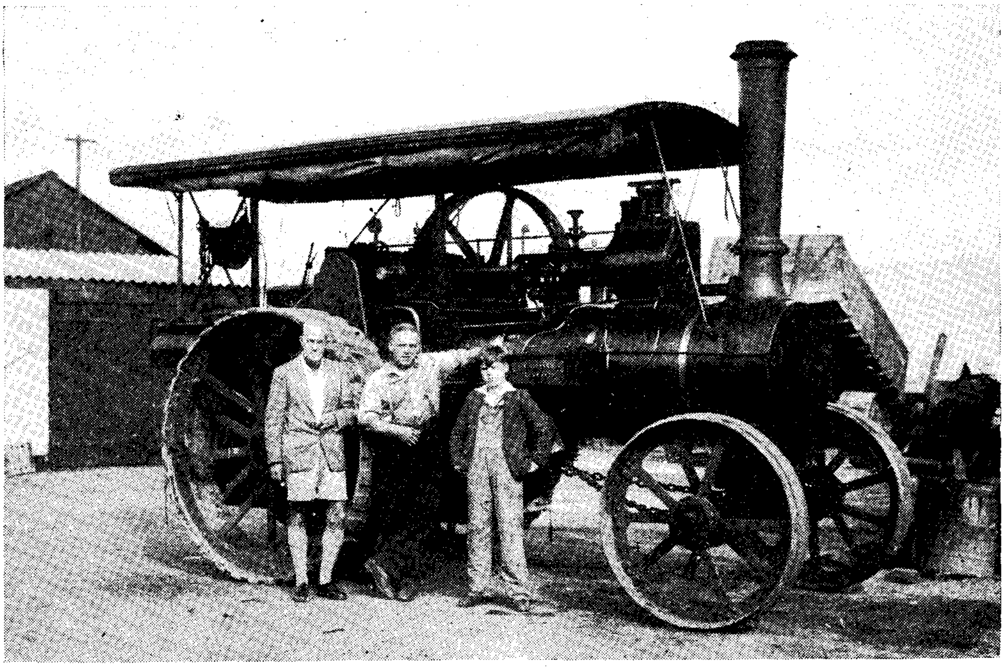
"Also the old drawing-office cronies at Elswick and later at Messrs. Reyrolle, Hebburn, Co. Durham.

"I might also mention that while in Western Australia in 1911 and 1912 I purchased several copies of the 'M.E.' in Baird's Arcade, Perth (I think Baird's was the name)."

This is interesting to us, for obvious reasons, and we are wondering whether this paragraph may eventually lead to our hearing something of or from the former associates mentioned by Mr. Bryan.

A Small Big One

● —OR IS it a big small one? The photograph reproduced on this page shows that, whichever it is, it is a gift worth having and preserving; for it is a McLaren traction engine which Mr. W. D. Ward, of Ackworth, has presented to the West Riding Small Locomotive Society. The engine is seen with steam up, ready for the 17-mile journey from Ackworth to its permanent site at the society's fine track at Blackgates.



Mr. Dan Hollings, who took the photograph, writes: "In the picture is Mr. Geo. Perrem (South Africa), in shorts, with Mr. E. Crookes and son, driver and steersman respectively. The engine arrived at Blackgates without incident other than two stops for water—one of which was at a petrol station! It was kept in steam throughout our passenger-hauling event, July 28th-29th, when we carried 2,892 passengers a minimum of three laps of our track, equal to three-eighths of a mile, each."

"Everything Comes . . ."

● JUST OVER two years ago, we received a letter from a London reader engaged in public transport who seemed keen to take up model engineering as a hobby, but he bemoaned the fact that it was too expensive for the ordinary working man. We have just heard from him again, and what a change!

Referring to his previous letter, he writes:—"I received a very pleasant letter from you, in terms which showed me that you understood my difficulties." He certainly had our sympathy and we offered what slender advice was possible in the circumstances, because we had no doubt of our friend's enthusiasm. We know that the really keen enthusiast will watch for and seize any chance that will bring him what he wants.

So it has been in this case; for about a year ago our friend answered an advertisement published in THE MODEL ENGINEER and obtained a good post with an engineering firm, the proprietor of which is very keen on "M.E." types. The erstwhile transport employee is now the proud possessor of a new M.L.7 lathe and, so far, has built a vertical slide, a ½-in. capacity power bench drill and an electric locomotive; his letter goes on:—"I do not consider any of these productions to be up to 'M.E.' standards, but I hope time will have its effects. So you see, Mr. Editor, that I consider my changed circumstances as being directly due to you and 'M.E.'"

We much appreciate that compliment, and we reciprocate by offering every good wish for future happy and successful model making; but we still believe that our friend's enthusiasm and resolution really won the day.

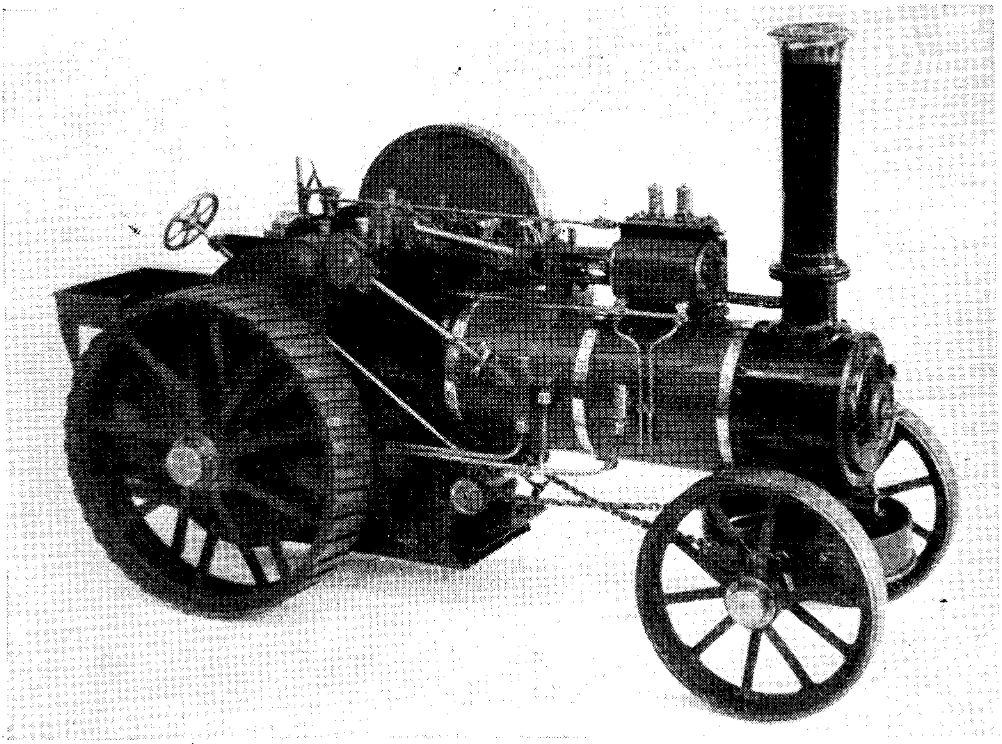
Portably Permanent, or Permanently Portable?

● THE FOLLOWING episode is reported in the bulletin of the West Riding Small Locomotive Society, and the track referred to is the splendid multi-gauge structure at Blackgates, near Bradford.

At a recent track event, two ladies were viewing the scene. One of them, probably conscious of the presence of Mr. Duncan's lorries nearby, and the society's traction engine standing not far away, was overhead to say to the other: "You know, this railway is only here for a week; then they are taking it somewhere else." Where ignorance is bliss . . !

*Traction and Portable Engines
at the "M.E." Exhibition
by W. J. Hughes

A FREE-LANCE traction engine by J. E. W. Walsham was obviously built by a man who knows something of his subject, for there was little or no inconsistency with correct traction engine practice. The engine is a single-cylinder type, with slide-valve operated by Stephenson link-motion; the two-speed gear is between the hornplates, and the pump is mounted on the side of the boiler, driven diagonally by an eccentric on the crankshaft.



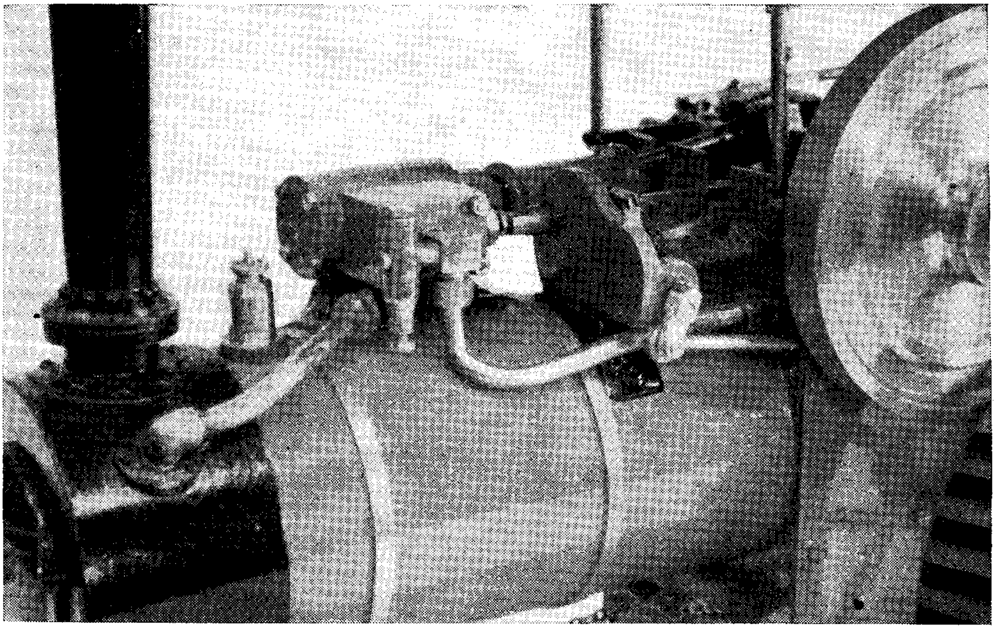
Free-lance model of a traction engine by J. E. W. Walsham, which was true to correct practice in most respects, although spoked flywheels were more usual on a general-purpose engine

The controls were nicely to proportion—nothing makes a model look "modellish" more than over-thick levers—and the engine had obviously been used, which had taken away the newness and given her the authentic look of one which had done some work and liked it. This model was highly commended by the judges.

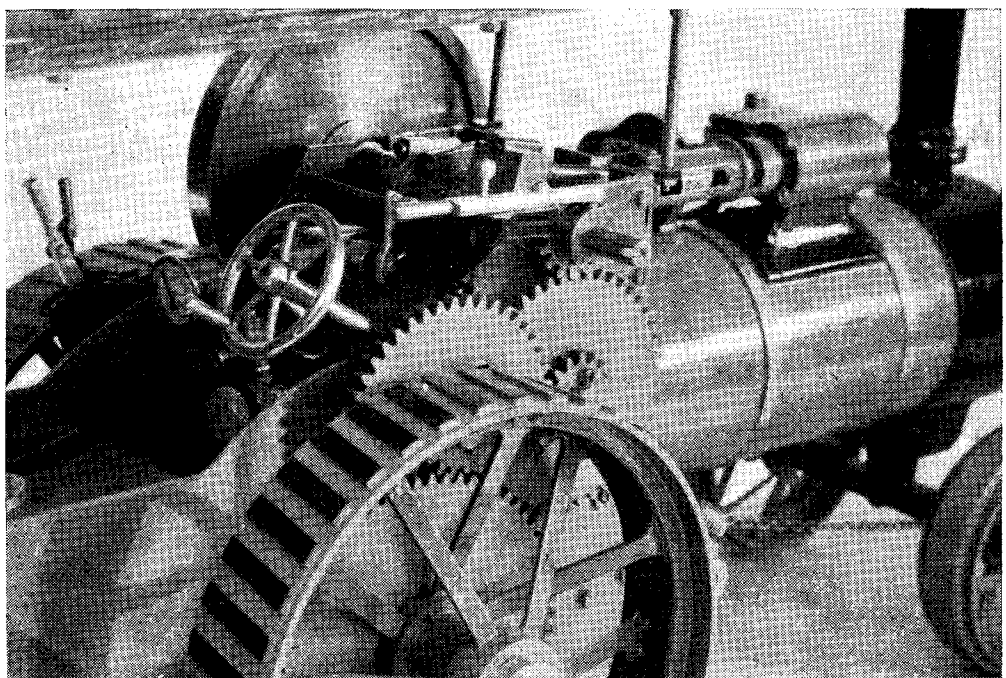
The two remaining traction engines, I regret to say, had a great many faults, but here again several of these are due to the original design and not to the builders themselves. Many engines have been built in the past to this so-called "¾-in. scale Burrell traction engine" design, and no doubt many more will be built in the future, but I cannot state too emphatically that they will never resemble any prototype traction engine that was ever built, except in a superficial way.

Among the faults may be listed the following: (1) Boiler diameter much too large; (2) only eight spokes in front wheels—there should be *at least* ten; (3) only twelve spokes in hind wheels, where there should be at least sixteen; (4) trunk-guide to crosshead should contain the gland, and not skip round it, so to speak—(and Burrell fitted slide-bars, anyway!); (5) tender sides in one piece with hornplates; (6) chimney badly proportioned; (7) single-speed; (8) part of gearing mounted on a stud on the side

*Continued from page 380, "M.E.," September 20, 1951.



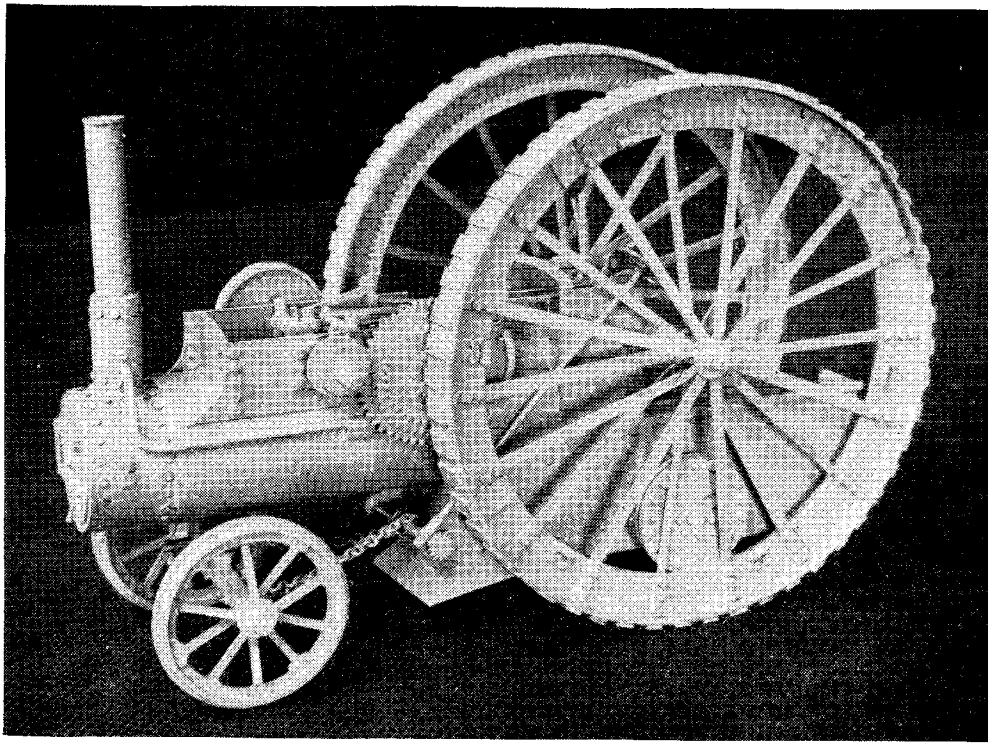
A free-lance traction engine with many faults, some of which are detailed in the text. Others include disc flywheel, and separate steam pipe to cylinder



Offside view of the free-lance engine, showing other errors mentioned in the text

of the hornplate, instead of correctly on a shaft; which I think will do to go on with.

I mean nothing personal to either of these exhibitors in mentioning the above, of course, but there were one or two obvious faults due to themselves. For example, one engine had *copper* strakes riveted to the hind wheels, where a moment's thought would have told that it was entirely unsuitable; the other had a single safety-valve mounted on top of the boiler, where a glance at a photograph would have shown that a pair of valves should be mounted on top of the cylinder. At the same time, both of these models showed a promise of better things, and it is hoped that we shall see this promise fulfilled in the future.



Small "solid" model of the Fowler "twelve-footer" which, despite certain crudities, gives a good impression of the prototype

The Historical Models

The six historical models were made in card and wood, and gave a very realistic impression, though more attention to finish and detail would have made them infinitely better. For example, the dummy rivet-heads were often much oversize, and the grain of wood was often visible through the paint. Even so, the models were well worth studying.

Perhaps the most interesting and unorthodox one was the Fowler with hind wheels 12 ft. in diameter, which was an early attempt to distribute the weight of the engine over a bigger ground area—a problem later solved by the "caterpillar" track. The large wheels each had a circular track near the periphery which rolled on the smaller double-flanged wheels fixed low down at the sides. It was the axle of these small wheels which took the weight of the engine, the large wheels floating on a dead axle. The lower axle was sprung, and both were connected by links to keep them at a constant distance.

The cylinders were over the firebox, driving forward to the crankshaft, and a three-speed gear took the drive to an intermediate shaft, on either end of which a small pinion was mounted to drive the large circular rack bolted to each wheel.

Of the other models, one was an early Ransome's engine and another a vintage Savage steam-wagon.

Portables

Among the portable engines the best was the Robey twin-cylinder engine by V. B. Ferguson, of Cheltenham, which was commended by the judges. As shown in the photograph, this was a very realistic model, nicely finished, painted and lined; it was built to ½-in. scale.

In a pleasant chat with Mr. Ferguson, he told me that he had seen a dozen or so portable engines in a scrapyard, and had gone along with notebook and rule to measure up the one which

particularly took his fancy—the Robey twin-cylinder. This was very fortunate, because every one of them had been cut up when he passed the yard three weeks later.

The slide-valves are between the cylinders, and the governor valve is worked by a nicely-made high-speed type governor. The cranks are set as usual at 90 deg.; the big-ends are correctly strapped and cottered.

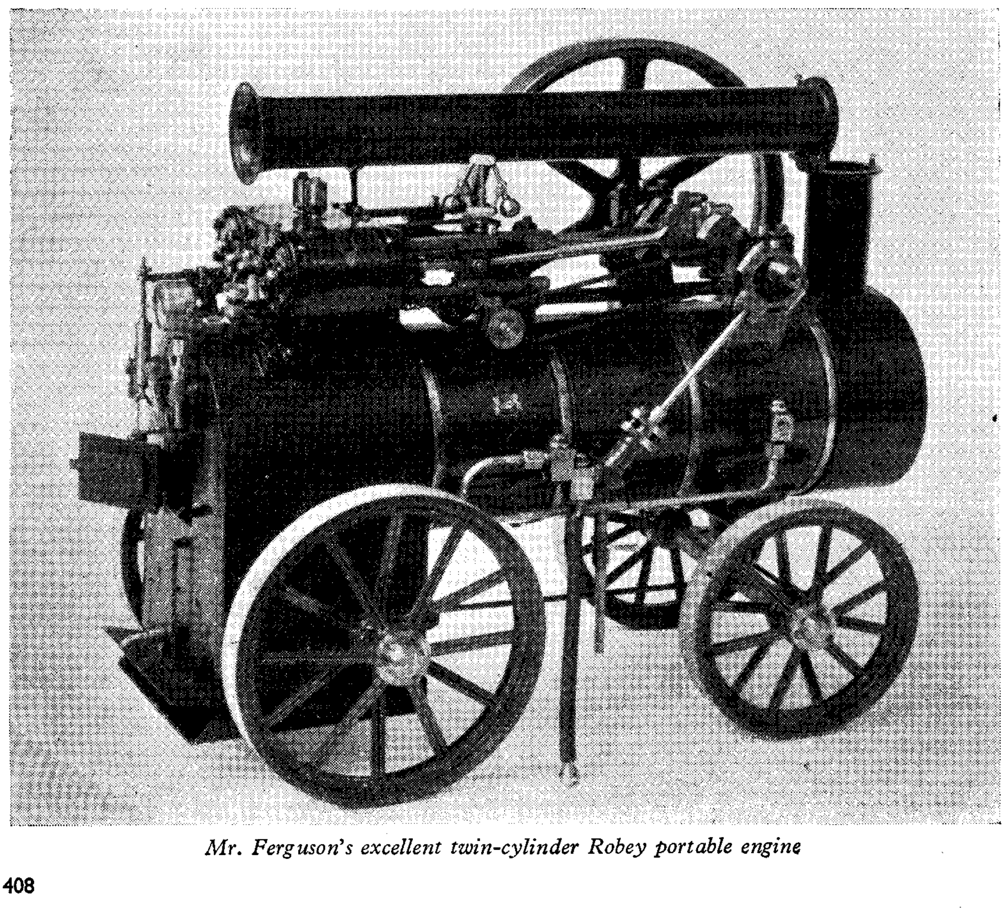
At several local exhibitions the model has been run under steam—she is coal-fired of course—for hours on end, and has created great interest, as only a live-steamer can do. She ticks over very quietly and pleasantly, the motion having that free-running capacity, with no sloppiness, which denotes good fitting in the first place. Incidentally, Mr. Ferguson has had other models at the "show" on previous occasions, and has been awarded several certificates, including a V.H.C. for a traction-engine.

The other twin-cylinder portable, by A. Beaumont of King's Lynn, was to 1-in. scale. Although a good model in most respects, it was sadly lacking in some. For instance, the governor was a not too life-like dummy, and although it was belt-driven from the crankshaft, it was not connected to the cylinder-block in any way, even by dummy linkage. Similarly, there was a dummy whistle, but it had no valve to operate it.

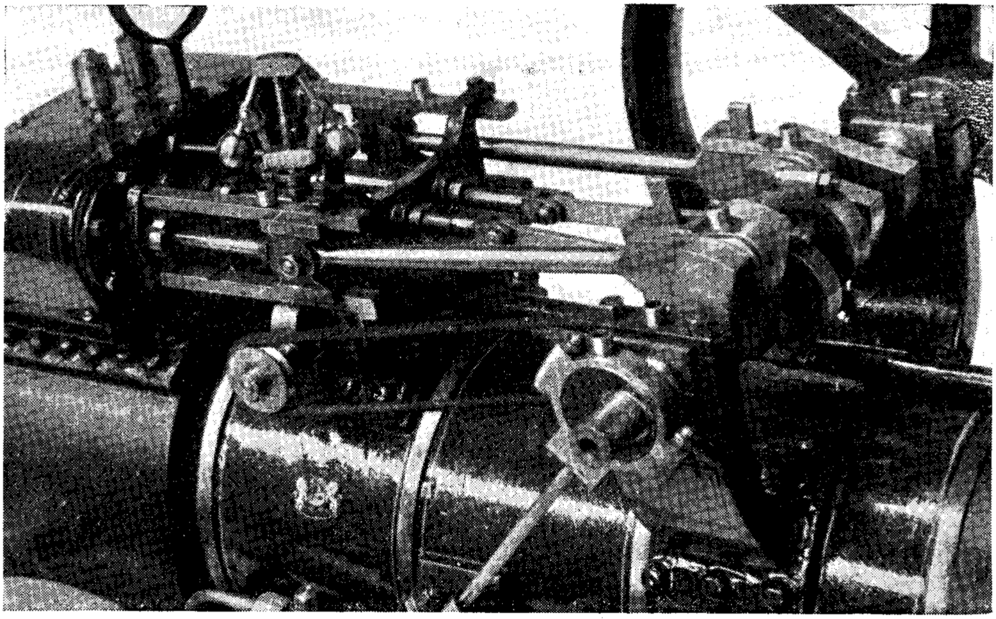
Again, round-headed screws had been used to hold the firebox-front (which loco-fans call the backhead) in place, and although an effort had been made to disguise the heads as rivets, apparently with soft-solder in the screwdriver slots, it was still apparent that they *were* screws. Moreover, they were over-scale. Another fault was that the connecting-rods were *too* highly-polished—I strongly suspect the use of a power-driven buff or dolly on them, which is entirely wrong, of course.

Nevertheless, the model was attractive in its own way, and I am sure Mr. Beaumont has derived great satisfaction from building and running it.

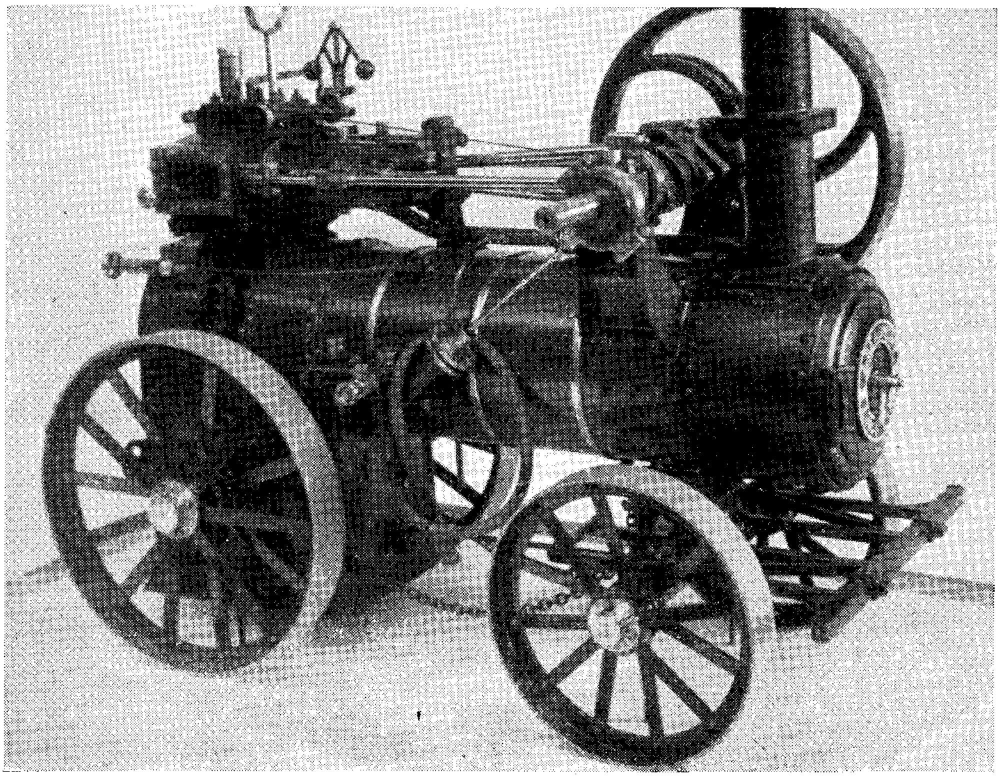
A "colonial type" portable engine by H. Smallbones of Andover was rather larger than the others, being built to $1\frac{1}{2}$-in. scale. It was another nice model, but there was a feeling of heaviness about the motion-work and some other parts, for which lighter sections could have been used to give a better scale appearance. As I have stressed before, it is not necessary (as a general rule) to "strengthen" parts by increasing their cross-sections, though I agree there is a strong temptation to do so. But many otherwise



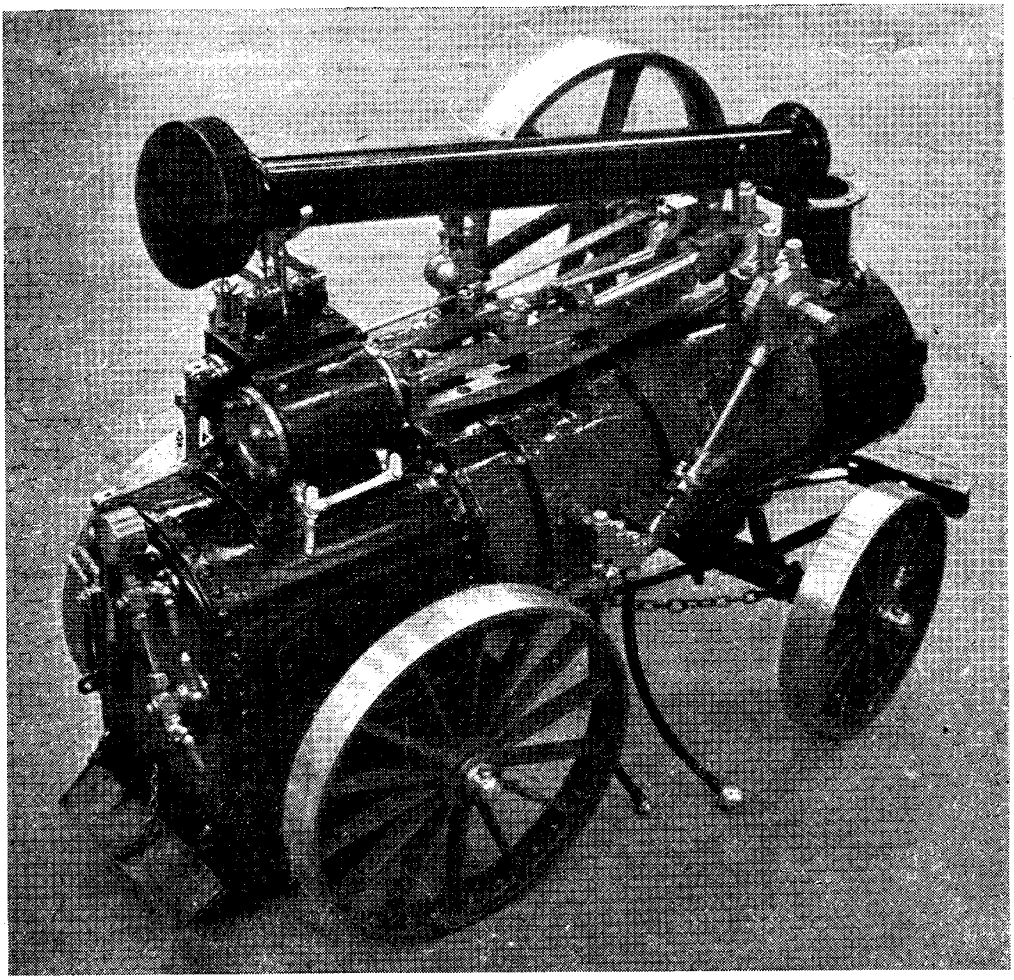
Mr. Ferguson's excellent twin-cylinder Robey portable engine



Close-up to show the nice finish and excellent detail of the Robey portable. The photograph does not do iustice to the paintwork



Another twin-cylinder portable, by A. Beaumont, would have been better with improved detail—note, for example, the dummy governor



Colonial-type portable engine which was rather "heavy" in appearance

excellent models are spoiled in appearance by this error, unfortunately.

There was also an impression of hastiness in the finishing, exemplified first by the hub-caps being retained by pieces of wire, and secondly by the paintwork containing a few bristles and a certain amount of dust or other impurities. Lining-out would improve the model, too.

Still another point was that it was only possible to drop the chimney in its cradle with the crank-shaft in one position; otherwise, it fouled either the eccentric-strap or the big-end. Thus, either the chimney base, or rest, or both, should have been higher; or—and this is more likely—the centre-line of the engine should have been lower. This is a point which all builders of free-lance portables and tractions should bear in mind; that subject to adequate clearance of moving parts, the centre-line of crankshaft and cylinder should be as close as possible to the boiler-top, in order to keep the centre of gravity as low as possible. It was fairly common prototype practice to cut away the lagging in way of the big-end to allow another inch or so; in fact, it was not unknown for the boiler-top itself to be "dented" at this point for the same reason.

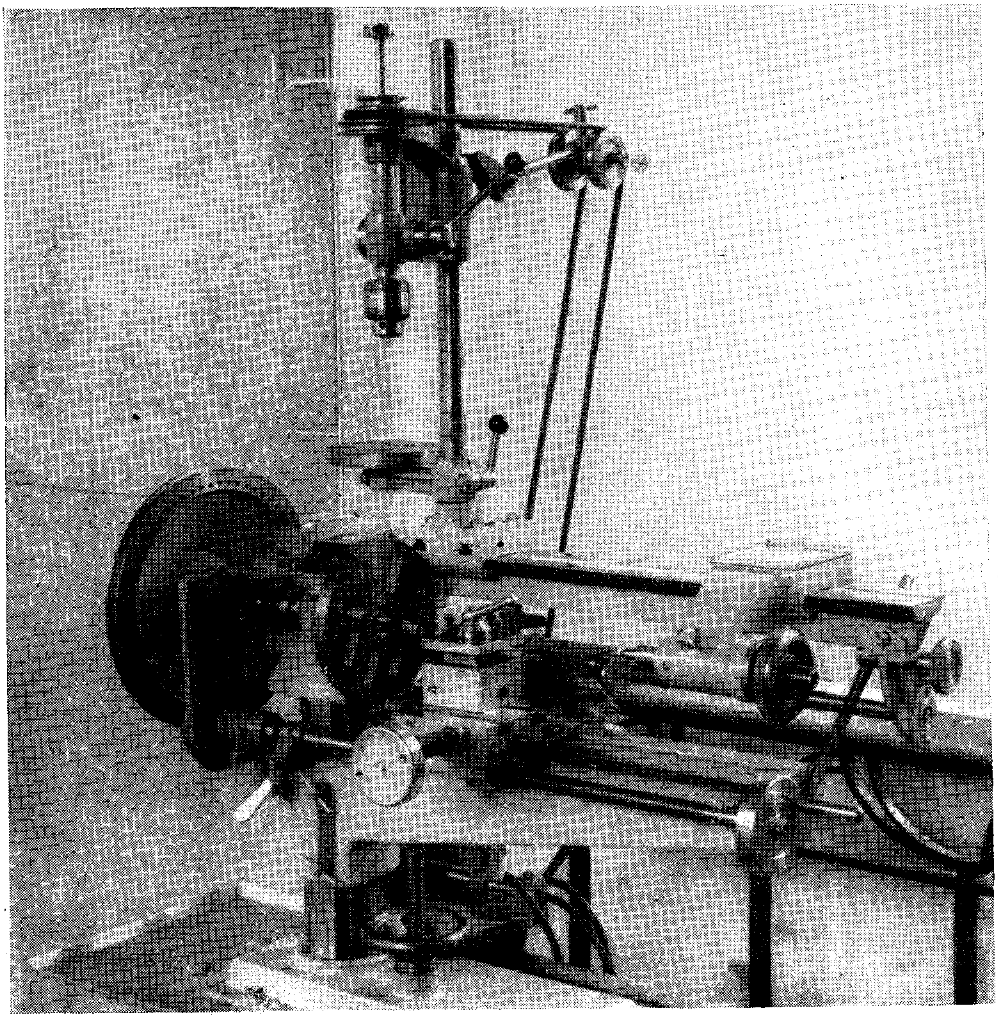
Finally, as mentioned in my preliminary report on the exhibition, the chief reason for criticism in THE MODEL ENGINEER of *any* model in the exhibition, by *any* writer, is to help the exhibitor and others to avoid making the same mistakes again. Many of these errors are made inadvertently, through lack of knowledge or for other reasons, and it can be taken that similar errors or omissions have probably been made at one time or another by the critics themselves, being human. We learn by our mistakes—but not if we don't *know* them to be mistakes. *Verbum sapiendum*——!

*WORKSHOP EQUIPMENT AT THE EXHIBITION

THE tools and workshop appliances exhibited in the competition section of the exhibition contained a number of interesting items. The first tool to be mentioned is the free-lance lathe shown by Mr. W. D. Urwick of Taplow. This lathe has already been described in THE MODEL ENGINEER for March 1st, 1951. Those readers, therefore, who require more complete details of the construction of this machine are advised to refer to this article.

*Continued from page 389, " M.E.," September 20, 1951.

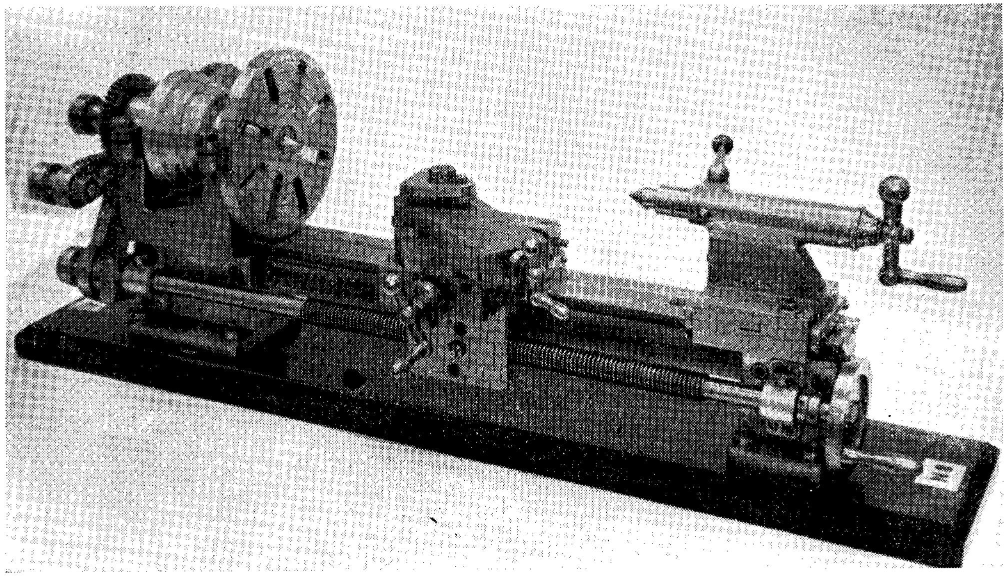
Mr. Urwick has made an interesting attempt at solving the problem of providing a universal machine tool, as will be seen from the illustration, for the equipment is capable of milling and drilling as well as plain turning and screwcutting. The headstock follows closely the design of the Exe lathe, whilst the tailstock evidently owes something to Drummond machine practice. As will be seen, the bed of the lathe component is carried on a circular vertical column of large diameter. True alignment of the bed with the centre-line of the headstock and tailstock is ensured by means of a triangular radial gib-key.



Mr. W. D. Urwick's free-lance lathe

This device is the subject of a provisional patent. The raising and lowering of the bed for either milling or boring purposes is controlled by a large hand-wheel provided with a ball thrust-bearing.

The separate T-section member carrying the Cowell drilling machine and the tailstock is provided with an adjustable stay, to ensure rigidity, the drilling machine may be moved along the top member and locked in any desired position, since the back shaft provided for driving the machine has an axial key-way that allows the driving pulley to slide along the shaft.



A $2\frac{1}{4}$-in. screwcutting lathe by Mr. G. D. Reynolds

As might be expected in a machine designed for milling and boring, a large T-slotted boring table is fitted on the lathe bed. There is no apron and the leadscrew nut is solid. The machine was exhibited with both a 4-way toolpost and a top-slide mounted on the boring table.

In order to obtain rapid alignment of the driving belts the motor mounting base is arranged to slide and can then be locked when in the correct position. The lathe as a whole had evidently been carefully made, and much thought had been given to details of design. Many dislike universal machines on the ground that they are, at best, compromises. Nevertheless, Mr. Urwick evidently finds the tool satisfactory for his own purposes, and his enterprise earned him a well-deserved Bronze Medal.

An interesting small lathe was entered by Mr. G. D. Reynolds of Farnborough. This tool has a centre-height of $2\frac{1}{4}$ in., and will admit 10 in. between centres. The headstock and tailstock bodies are of built-up construction and are of generous proportions. The use of Sifbronze as a medium for brazing these components allows adequate fillets to be formed where they are needed.

The bed is built up from two pieces of bright mild-steel material secured together by Allen screws. The effect is to produce a T-sectioned bed having an upper component that has been machined to provide angular ways for the saddle and tailstock. The headstock is provided with a back gear that is carried in an eccentric bush. Engagement of the gear is made by means of a short handle ; this rotates the eccentric bush through part of a turn, and when the gears have been engaged the eccentric bush is locked by a knurled-headed thumb-screw.

It would appear that the Allen screw used for locking the light alloy cone pulley to the lathe mandrel must be undone to free the pulley when the back gear is being used ; for a careful inspection failed to reveal any other device for releasing the cone pulley.

The compound slide-rest is well made and has indexes to both slides. These indexes are fixed. Though this point is of no great importance where the top-slide is concerned, it seems a pity that no attempt was made to provide the cross-slide with an adjustable index. However, the finish of these indexes is to be commended ; both the figuring and index lines having been clearly and evenly engraved.

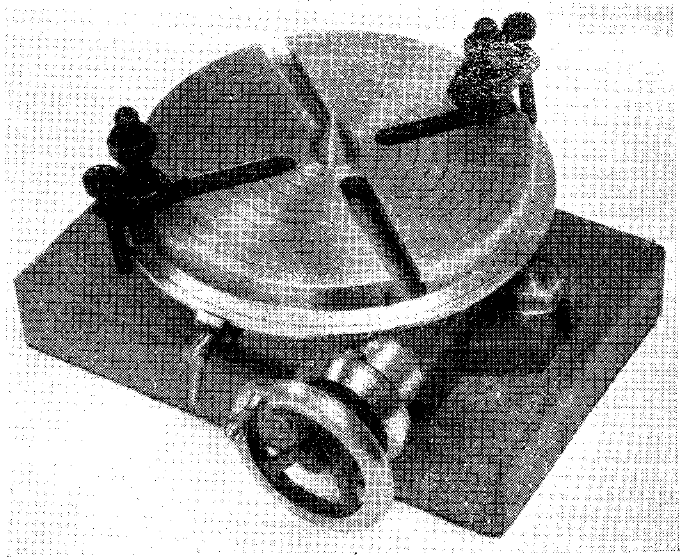
The index wheel fitted to the end of the leadscrew is also an example of careful workmanship. In passing, it was noted that the leadscrew nut was solid and that there was, as yet, no provision for disengaging the leadscrew from the saddle. There would appear to be sufficient room on the apron for a simple throw-out device so it is probable that Mr. Reynolds intends to fit some means of leadscrew disengagement later.

A very commendable feature on this lathe was the provision of felt pads, enclosed by metal covers, to both the saddle and the tailstock. The fitting of these pads will do much to mini-

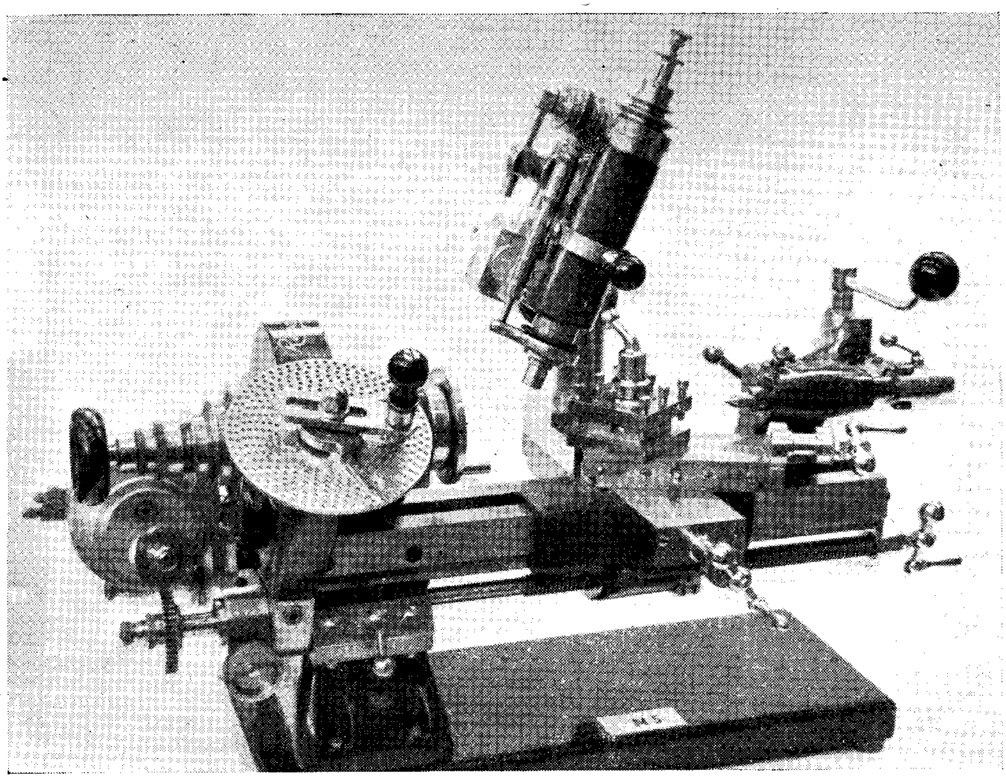
mise wear of the bed caused by swarf and metal particles.

Some thought had evidently been given to the design of the tool, and this point, together with the careful workmanship, was rewarded by a Very Highly Commended Diploma.

The rotary dividing table made by Mr. R. R. Watson, though apparently of conventional pattern, was an excellent example of careful workmanship. This device was designed to be read in degrees and every two minutes, and was provided with work clamps and a pump centre for aligning the work. The work clamps, of steel, were finished in blue, and the sharpness of the knurling on the finger screws was particularly noteworthy. The maker had made his own patterns, and the casting was in "Mechanite."



Mr. R. R. Watson's rotary table



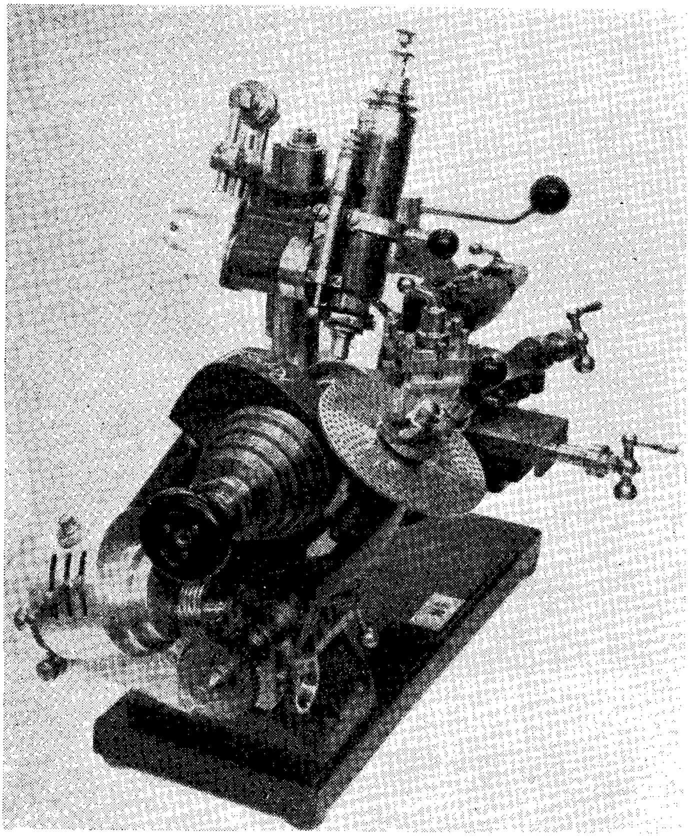
An experimenter's lathe exhibited by Messrs. W. Fowkes and T. Turner

Apart from the general machining, carried out in a workman-like manner, the engraving must be commended. This is a point that seems to baffle some constructors, and many an otherwise well-finished device is often found to have been spoilt by faulty and uneven engraving. The movement of the rotary table was very sweet, showing that the workmanship on the internal parts was of a high order. The maker of the device will doubtless find it of service to him, for this rotary table is a very practical example of equipment well deserving the Highly Commended diploma which was awarded to him.

Undoubtedly, the most interesting exhibit in the section devoted to tools and workshop appliances is the 2-in. centre lathe made by Mr. W. Fowkes and Mr. T. Turner, of Matlock, Bath. The tool is described as an experimenter's lathe and is equipped with a very full range of equipment. The bed, of channel section, has one vee way only. The headstock is provided with hardened bearings at the front end whilst, at the rear end, a pair of preloaded combined radial-thrust bearings support the mandrel.

The mandrel nose is threaded presumably to accommodate chucks, driver plate and faceplate, though only the driver plate was on view. Standard 8 mm. collets are fitted in the bore of the mandrel, and screwed by a draw-in spindle in the usual way.

The driving arrangements for this lathe are somewhat unusual, for a normal back gear is not employed. Instead, a worm-drive to a worm-wheel on the mandrel is used. The mandrel worm-shaft is driven from a lay-shaft at the back of the lathe, the drive being taken presumably from the same overhead gear that drives the drilling and milling spindle. The worm-shaft can be disconnected from the mandrel worm-wheel by simply throwing over a small lever that lifts the worm out of engagement. The mandrel may then be driven by means of the 4-step cone-pulley machined to accommodate a standard $\frac{3}{8}$-in. vee-belt.



The experimenter's lathe, showing the gearbox and the leadscrew drive

The lay-shaft at the back of the lathe is also used to drive the leadscrew through a gearbox that gives ratios of 2 : 1 up, 1 : 1, and 2 : 1 down. This system may also be used, in conjunction with a series of worms that form part of the equipment, for screwcutting.

In these circumstances, the worm drive to the mandrel must also be thrown in and driven from the lay-shaft to ensure a positive relationship between the mandrel and leadscrew.

The worm-wheel on the mandrel is also used for dividing purposes, and a set of three division plates having a total of 24 rows of holes is provided.

The saddle has ample bearing surface on the ways of the bed, but is not provided with a split-nut. In view of the relatively small movement that the saddle has to make in travelling from one end of the lathe bed to the other, the lack of this fitting is, in all probability, no great disadvantage.

The cross-slide carries a top-slide fitted with a 4-way toolpost and a milling and drilling attachment that is clamped to the cross-slide vees.

The top-slide feedscrew operates through a train of gears so as to enable the feed screwhandle to clear the tailstock, when the slide is set parallel with the axis of the lathe. This arrangement also prevents the handle fouling the cross-slide, when the top is set for turning vees in pulleys, and other work of a like nature. Both slides are fitted with indexes. The knurling applied to these fitments as well as to other parts of the lathe was of so poor a standard that the judges were much exercised when awarding marks to the

exhibit as a whole. It seems very strange that the two makers, who clearly appreciate good workmanship and demonstrate quite convincingly that they can produce well-finished work in all other respects, should have presented for inspection by the judges, knurling that was so badly carried out.

As will be seen in the illustrations (including the one on the cover of this issue) the tailstock has a lever feed and depth stop. The tailstock slides on the bar ways of the lathe bed, thus enabling the saddle to pass the base of the tailstock casting, and slide to the end of the bed.

The milling and drilling spindle seen in the illustrations has the same bearing arrangements as those in the headstock, and a depth stop and spindle-locking device is provided. The attachment is fully compounded and is adapted for 8 mm. Lorch collets. This exhibit was easily the best finished and most versatile piece of workshop equipment to be seen in the exhibition, and was rewarded with a Silver Medal; had the knurling, that has already been the subject of comment, been of a finish comparable with all the rest of the machine, it is likely that the exhibitors would have qualified for some additional award.

THE 1951 "M.E." EXHIBITION PRIZE WINNERS

The Club Team Competition

The Birmingham Ship Model Society.

The "M.E." Ship Model Societies Challenge Trophy

The Birmingham Ship Model Society.

Individual Championship Cups

Locomotives.—T. A. Bott of Headington. 3½-in. gauge, ¾ in. to 1 ft. scale, 4-6-2 L.M.S. Duchess class locomotive.

Steam and Motor Ships.—F. W. Crudass of Wimbledon. H.M. frigate *Mermaid* at anchor, 1943. Scale 1 in. to 16 ft.

Sailing Ships.—A. E. Field of Walsall. Model of the clipper *Cutty Sark.*

General Engineering Models.—A. J. Kent and F. H. Tapper of Smethwick. "Tangye" 1890-1900 type gas engine. Scale 3 in. to 1 ft.

Silver Medals

H. J. Refoy of Old Windsor. 3½-in. gauge, ¾ in. to 1 ft. scale, 4-6-0 G.W.R. King class locomotive.

E. H. Whittaker of Timperley. 16.5 mm. gauge, 4 mm. to 1 ft. scale, 4-6-0 G.W.R. King class locomotive.

E. N. Taylor of Gosport. Two waterline models, M.V. *Portsmouth* and M.V. *Southsea.* Scale 1/25 in. to 1 ft.

A. S. Ablett of Ruislip. Electrically-driven model of a 45 ft. motor sailer. Scale ¾ in. to 1 ft. approx.

N. M. Peters of Wallington. Battle class "C" destroyer, H.M.S. *Barrosa.* Scale $\frac{3}{16}$ in. to 1 ft.

Rear-Admiral C. M. Blackman (R.N. Retd.), of Bishops Waltham. H.M. paddle frigate *Vulture*, 1846. Scale 1/96th.

C. J. Clarke of West Bromwich. Wood brigantine *Raven, c.* 1875. Scale $\frac{3}{16}$ in. to 1 ft.

D. McNarry of Barton-on-Sea. Dockyard model of H.M.S. *Prince*, first rate 1670. Scale 1 in. to 50 ft.

D. McNarry of Barton-on-Sea. 12-gun brig-of-war, *c.* 1840. Scale 1 in. to 50 ft.

R. F. W. Jarvis of High Wycombe. 80 in. Cornish pumping engine of about 1830. Scale 1 in. to 1 ft.

F. W. Waterton of Stretford. 30 c.c. 6-cylinder twin overhead camshaft petrol engine and magneto.

G. Wills of London, E.10. Stevens 495 c.c. motor-cycle combination. Scale 3 in. to 1 ft.

J. E. King of Horndean. Wallis and Steevens special road locomotive. Scale 1½ in. to 1 ft.

W. Fowkes and T. Turner of Matlock, Bath. "Repetit." An experimenter's 2 in. centre precision lathe.

C. W. Field of Reading. Model Grand Prix racing car.

C. B. Reeve of Hastings. Spring and fusee driven striking bracket clock.

S/Sgt. Conway, Cfn. Morrison, Cfn. Copson, Cfn. Lear, R.E.M.E., B.A.O.R. 4. 25 pndr. field gun.

J. H. Starck of Ruislip. Model Boudoir grand piano fitted with automatic musical movement. Scale 1/12th.

Bronze Medals

L. H. Cheesman of Rickmansworth. 5-in. gauge, 1 in. to 1 ft. scale, 4-6-0 G.W.R. King class locomotive.

F. H. Higgs of Shepperton. 1¼-in. gauge, 7 mm. to 1 ft. scale, 0-6-0T L.M.S. locomotive, Class "3F."

J. L. Hoskins of Par. 18-mm. gauge, 4 mm. to 1 ft. scale, 0-4-4T S.R. Class "H" locomotive.

R. V. Shelton of Dunstable. Scenic waterline model of the whale-catcher S.S. *Southern Wheeler.* Scale 1/10 in. to 1 ft.

K. W. Chappell of London, S.E.25. Petrol-driven cabin cruiser *Gemini.* Scale 1 in. to 1 ft.

W. Brogan of Hastings. British Railways' S.S. *Arnhem* with fully fitted interior. Scale ⅛ in. to 1 ft.

M. Cutler of Sheffield. Model of M.V. *Avon*, built to design of *Penang.*

R. L. Allen of Kings Lynn. Steam tug *Conservator*.

C. C. Jarvis of Southend-on-Sea. Free-lance cabin cruiser *Zephyr*. Scale $\frac{3}{4}$ in. to 1 ft. approx.

A. H. E. Saxton of London, S.W.12. Cross-channel paddle steamer *Paris*. Scale $\frac{1}{8}$ in. to 1 ft.

W. Cross of London, N.5. Free-lance Elizabethan galleon of about 1590. Scale 1/60th.

J. W. B. Soddy of Luton. Genoese carrack (16th century). Scale 1 in. to 6 ft.

D. A. Macdonald of London, S.W.12. Marblehead class racing yacht.

A. V. Gregory of Scunthorpe. Grimsby fishing smack of 55 years ago.

C. L. Robinson of Mexborough. American privateer sloop *Rattlesnake*. Scale $\frac{1}{4}$ in. to 1 ft.

R. Carpenter of Brighton. Waterline model of M.V. *Bruno*. Scale 1/35 in.

Mrs. Montagu-Fergusson of Gerrards Cross. Syrian schooner. Scale 1 in. to 10 ft.

G. H. Draper of Ilford. Model of a fishing boat. Scale $\frac{1}{2}$ in. to 1 ft.

K. P. Lewis of Birkenhead. British Railways M.V. *Cambria*. Scale 1 in. to 75 ft.

J. L. Bowen of London, E.12. Waterline model of M.V. *Rangitoto*, New Zealand Shipping Co. Ltd.

A. T. Tamplin of Birdham. Working model Churchill tank. Scale 1/6th approx.

E. Lowe of Rotherham. Showman's compound road locomotive. Scale $1\frac{1}{4}$ in. to 1 ft.

R. G. Stone of Eastham. Aveling and Porter 10-ton road roller. Scale $1\frac{1}{2}$ in. to 1 ft.

B. Stalham of Kings Lynn. Supercharged 15 c.c. four stroke V-twin i.c. engine.

W. D. Urwick of Taplow. Free-lance lathe with rise and fall bed.

R. J. Wallace of Cowes, I.O.W. Model jeep, fully fitted. Scale 1 in. to 1 ft.

S. W. Pearce of Sutton. Working model signal cabin and signals for one station. Up and down road and branch line with Sykes type lock and block instruments and repeaters.

G. F. Campbell of Whitstable. Diorama model of H.M.S. *Cyclops*, 1839 and diorama model of Dutch river scene.

C. R. Haupt of North Harrow. Free pendulum synchronome clock, with centre seconds sweep and half-minute impulse.

S. W. Witham of Reading. Working model cine-theatre.

P. Winton of Wembley. Tandem cart. Scale $1\frac{1}{2}$ in. to 1 ft.

Rev. L. C. Butler of Bletchley. 16 mm. cine-camera, clockwork driven, and 16 mm. sound-on-film recording apparatus.

Diplomas

Very Highly Commended—34 awards.
Special Very Highly Commended—1 award.
Highly Commended—22 awards.
Commended—21 awards.

SPECIAL PRIZES

The Michael C. Bradbrook Prize

W. Tucker of Bramhall. $3\frac{1}{2}$-in. gauge, $\frac{3}{4}$ in. to 1 ft. scale, 4-4-2 N.E.R. locomotive, Class "V."

The Bradbury-Winter Memorial Challenge Cup

G. Wills of London, E.10. Stevens 495 c.c. motor-cycle combination. Scale 3 in. to 1 ft.

The "Duplex" Prize

No award.

The Ferguson Prize

R. F. W. Jarvis of High Wycombe. 80 in. Cornish pumping engine of about 1830. Scale 1 in. to 1 ft.

The Hampshire Prize

J. T. King of Croydon. Waterline model of H.M.S. *Brissenden*. Scale 1 in. to 100 ft.

The "Kinemette" Prize

No award.

The Maze Cup

F. A. A. Pariser of Castle Bromwich. 18-gun brig-of-war *Procrius* of 1806. Scale $\frac{1}{4}$ in. to 1 ft.

The "Model Railway News" First Prize

A. J. Mathieson of Leeds, 6. 16.5 mm. gauge, 4 mm. scale, G.W.R. (ex-Cambrian Railway), 1st/3rd corridor coach.

The "Model Railway News" Second Prize

M. C. Witney of Harrow. $1\frac{1}{4}$-in. gauge, 7 mm. to 1 ft. scale, Great Eastern Railway composite coach.

The "Model Railway News" Third Prize

P. B. Denny of London, W.3. 4 mm. to 1 ft. scale, railway station buildings for a country market town.

The "Model Ships and Power Boats" Prize

M. Cutler of Sheffield. Model of M.V. *Avon* built to design of *Penang*.

The New York Society of Model Engineers Inc. Prize.

R. F. W. Jarvis of High Wycombe. 80 in. Cornish pumping engine of about 1830. Scale 1 in. to 1 ft.

The Precision Model Engineering Co. Prize

R. J. Wallace of Cowes, I.O.W. Model Jeep, fully fitted. Scale 1 in. to 1 ft.

Messrs. A. J. Reeves and Co. Prize

T. A. Bott of Headington. $3\frac{1}{2}$-in. gauge, $\frac{3}{4}$ in. to 1 ft. scale, 4-6-2 L.M.S. Duchess class locomotive.

The W. K. Waugh Prize

B. Palmer of Sheppey. $3\frac{1}{2}$-in. gauge, $\frac{3}{4}$ in. to 1 ft. scale, 0-6-0T P. V. Baker.

The "Wellingham" Cup

A. T. Judd of Birmingham. Electrically-driven model of steam coaster *Eleftheria*. Scale 4 mm. to 1 ft.

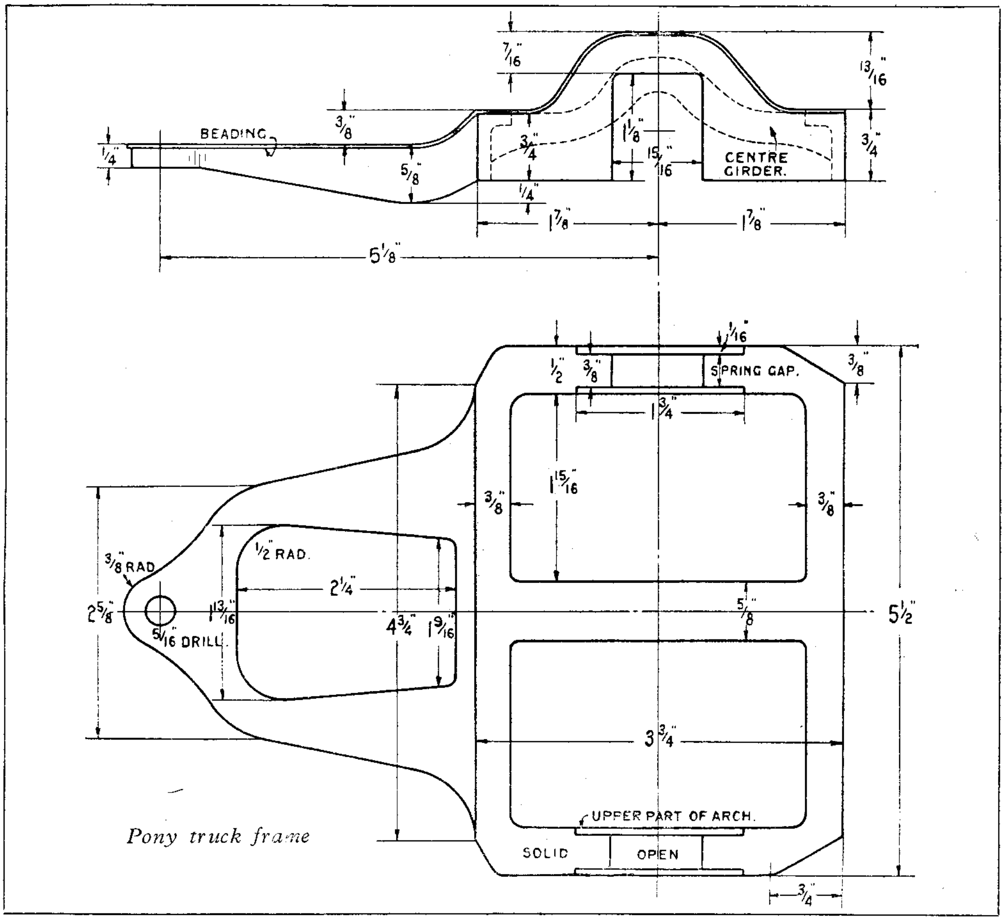
The Willis Cup

N. M. Peters of Wallington. Battle class "C" destroyer H.M.S. *Barrosa*. Scale $\frac{3}{16}$ in. to 1 ft.

"Britannia" in 3½-in. Gauge

by "L.B.S.C."

ON the full-sized engines, the bogie centre-slide is a real " Bill Massive " affair, with control springs both at back and front of the channel which houses it. Our small edition is a bit on the massive side, too, for a 3½-in. gauge job; but as the whole front end is a hefty proposition, especially the cylinders, we need something adequate to carry it. The sliding-block is a wee bit simpler than its full-sized relative; for sharply-curved lines, no side control springs are needed, nor are they desirable, because the side thrust when the bogie swings well over, would tend to throw the leading coupled wheels off the road. I fitted one of my own 2½-in. gauge 4-6-2 engines with side control springs, and the above is precisely what happened. She was better without them. No " nosing " took place on the straight runs, as the weight on the bogie bolster effectually damped it out. Designers of the past, in a frantic endeavour to overcome the adhesion bogey—there is a difference between " bogie " and " bogey "; some catalogue editors still need lessons in spelling!—put all the weight on the coupled wheels, and left the bogie practically dangling from the pin. Such tactics are of no use to your humble servant. The bogies on my own engines carry their share of the load, same as in full-size practice, and they guide the engine in the manner usually observed by all well-bred and designed bogies, and never jump the road unless forced off by a defective rail joint or similar fault. I get all



Pony truck frame

the adhesion needed, by seeing that there is full-width contact between the wheel tread and rail head. With correct handling of the regulator, there is no slipping on dry rails with the heaviest loads; and on a damp and foggy evening, my single-wheeler *Grosvenor* gets away without a slip, if the sand valves are opened, same as her big sister did in the far-off days of long ago, when twopence purchased what Bert Smiff would call, " 'arf-a-pint o' wallop an' a packet o' fags."

Sliding Block

The bogie slides sideways on a rectangular flanged block which fits into the channel in the centre part. This block, in its turn, pivots on the bogie pin, so that the bogie has both swivelling and sliding movement. The block can be made either from a casting, or from a solid chunk of metal measuring approximately $1\frac{1}{4}$ in. long, $\frac{3}{4}$ in. wide and $\frac{7}{8}$ in. deep. Any metal except aluminium will do; castings may possibly be available in iron. A casting will probably only need cleaning up with a file; or if a milling machine is available, it can be held in the machine-vice on the table of the machine, and the sliding surfaces cleaned up with a side-and-face cutter on the arbor. I machined up my own centre block in that way. If only the lathe is available, the job can be done in precisely the same way as I have described for axleboxes, so there is no need to go through all the full ritual again. The top can be faced off by gripping the block in the four-jaw, flanged end outwards. Set it to run truly; if any readers encounter difficulty in setting square work to run truly in a four-jaw chuck, set it " by eye " at first, as near as you can. Run up a tool in the slide-rest, until it nearly touches one corner of the work, pull the belt by hand, and you'll see in two wags of a dog's tail, which way the piece wants to be set over for absolutely true running, and which jaws need adjustment for the setting-over process. One of my girls at the munition shop which I looked after during the latter part of the Kaiser's war, was a real nugget at the job; she just put the metal in the chuck, pulled the belt, a couple of flicks of the chuck key, and there it was, absolutely O.K. I've often had a quiet chuckle, when reading queries sent by the less-experienced followers of these notes, and thinking that if one of those girls had been his wife, he wouldn't have had to worry me any!

Face off the top of the block with a round-nose tool set crosswise in the rest, until the flanges at either side are 5/32 in. thick; then centre deeply, with a centre-drill in the tailstock chuck, and drill right through with a $\frac{5}{16}$-in. drill; or better still, use letter " O " if you have that size. An 8-mm. will also do it. It doesn't matter about facing the bottom of the block, as it doesn't touch anything, and nobody can see it.

To make up the sliding-block from solid metal, simply saw it to shape, and a weeny bit over finished size; then machine it exactly as if it were a casting, as mentioned above. Note, the fit of the block in the channel of the bogie centre, doesn't want to be too precise; it should be quite free to slide full length from side to side, with the flanges resting on the metal at the top of the channel.

If the engine will be running on a road with curves of not less than about 30 ft. radius, side control springs may be fitted. The only alteration needed to the sliding-block, will be the provision of a couple of holes in it, to house the springs. Drill them with $\frac{1}{4}$-in. drill, at $\frac{5}{16}$ in. from the bottom of each flat side, on the vertical centre line; go just deep enough to avoid piercing the bogie pin-hole. These springs are, however, only a refinement on a $3\frac{1}{2}$-in. gauge job, and the engine will be just as steady without them. My own engine hasn't any, as my south curve is only 17 ft. 6 in. radius. Incidentally, *Britannia* is the only type of 4-6-2 with a wheelbase flexible enough to run around this curve, in the $3\frac{1}{2}$-in. gauge size; both L.M.S. and L.N.E.R.-type pacifics are unable to take the short radius, although 4-6-0's like *Doris*, and the G.W. " County " class, also Southern *King Arthur* type, get around quite well.

Bogie Pin and Spacer

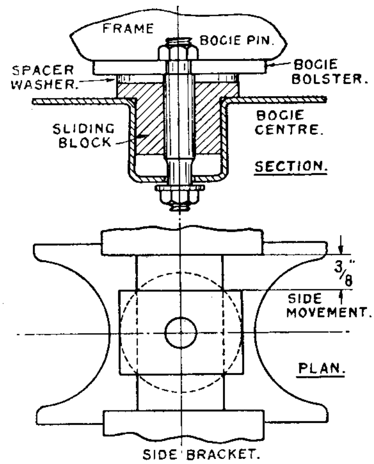
The bogie pin is made from a piece of $\frac{5}{16}$ in. round mild-steel, faced off at both ends to an overall length of 1 25/32 in. Chuck in three-jaw, and turn down $\frac{3}{8}$ in. length to 9/32 in. diameter, a good fit in the hole in the bogie bolster. Further reduce a full $\frac{1}{4}$ in. length to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$ in. × 40. Reverse in chuck, and turn down 17/32 in. length of the other end to a full 15/64 in. diameter, so that it will be perfectly free to slide in the $\frac{1}{4}$-in. slot in the bottom of the bogie centre. Use a round-nose tool for this, so as to get a radius at the place shown in the illustration. Then turn down $\frac{1}{4}$ in. length to $\frac{3}{16}$ in. diameter with an ordinary knife tool, and screw $\frac{3}{16}$ in. × 40.

The spacer can be parted off a piece of $1\frac{1}{4}$-in. round rod, held in three-jaw, faced, centred, and drilled $\frac{5}{16}$ in. clearing; or alternatively it may be cut from a piece of 13-gauge or 3/32 in. sheet brass. Mark out the circle, with a pair of dividers, and either saw to outline with a piercing saw (metal-cutting fretsaw) or cut roughly to outline with a bench shear or a big pair of snips, and finish with a file. It doesn't matter a bean if the circle isn't perfect; nobody sees it, and the working of the engine isn't affected in the least, so there is nothing to worry about!

How to Erect the Bogie

The assembly is simple. Put the $\frac{1}{4}$-in. end of the bogie pin through the hole in the bolster, which the 9/32-in. plain part should fit nicely, and secure with a $\frac{1}{4}$ in. × 40 nut made from $\frac{3}{8}$-in. hexagon steel or brass rod. With the chassis upside down on the bench, put the spacer over the bogie pin. Put the sliding-block in place in the bogie channel. If the side springs are required, wind them up from 20-gauge steel wire, to an easy sliding fit in the holes in the side of the block. When uncompressed, with the ends squared off by touching on the side of an emery-wheel at full speed, they should measure just under 1 in. long, so that they will be at kind of half-compression when the bogie is in the central position on a straight bit of road. Put the springs in the holes in the sliding block, and squeeze them in until you can insert the block into its place in the bogie channel. The whole bogie

can then be put in position, the pin going through the hole in the block, and the small end of it projecting through the slot at the bottom of the channel. Put on a $\frac{3}{16}$-in. steel washer, and secure it with a $\frac{3}{16}$-in. × 40 nut made from $\frac{5}{16}$-in. hexagon steel or brass rod. The complete assembly is shown in the sectional illustration.



How bogie is erected

Pony Truck

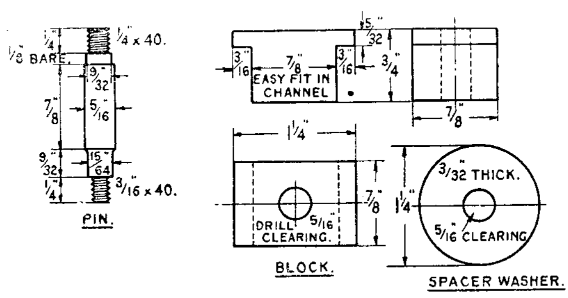
The trailing pony truck on the full-sized engines, is a built-up job, and very substantial. It has double plate frames at the rear end, where the axleboxes are situated, and inverted-camber leaf springs take the weight. They are centrally-placed, being located between the frame plates. To counteract any possible weakness, due to the large openings for the roller-bearing axleboxes, there are two big arched girders also provided, to connect the front and rear cross-members. The front part of the pony truck is of the usual triangular shape, the sides being low enough to allow plenty of side movement without fouling the engine cradle frame; and they are fairly deep at the point where they join the rear section.

The pony truck that I am specifying for the $3\frac{1}{2}$-in. gauge engine conforms generally to the full-size design, but is altered slightly in detail, to suit the smaller size. It may interest new readers, and many old ones, to know that a famous locomotive engineer, now retired, said in my own workshop, only a few weeks ago, that a little engine which was a slavish copy of a full-sized one in every repect, would never be as satisfactory as one designed in accordance with its size, and the work it was expected to do. This viewpoint is exactly what I have always been trying to drive home; and although my contentions have been proved again and again, confirmation from such a source was, as you may guess, very much appreciated by your humble servant. But *what* a "poke in the snoot," as our transatlantic cousins would put it, to those certain relations of Inspector Meticulous, with whom we are so familiar!

The two principal alterations are, the substitution of a single central stay girder for the two of the big engine, and the adoption of rollers instead of slides, to transmit the weight of the trailing end of the engine, to the pony truck. The chief reason for the latter, was to allow the pony to swing easily on fairly sharp curves, which are taken at a far greater proportional speed than in full size. My $2\frac{1}{2}$-in. gauge *Tugboat Annie*, which is *Britannia's* equivalent, has these roller brackets, and she will sail around my south curve at an equivalent 80 m.p.h. in perfect safety. The pony truck has never derailed so far. I specified them also for *Pamela*. As to the single central girder, I considered at first, the possibility of doing without any at all; but—as in full size—the frames are weakened by the openings for the big axleboxes, and it wouldn't have taken much of a clout, to cause bad distortion of an unstayed pony frame. Accidents *do* happen sometimes on little railways! Therefore I added the central girder, which you can see in the illustrations. It connects the front and back members, and is arched to clear the axle. In a built-up frame, it may be of rectangular section; but in a casting, it is made channel-section, with the opening underneath.

How to Machine a Cast Frame

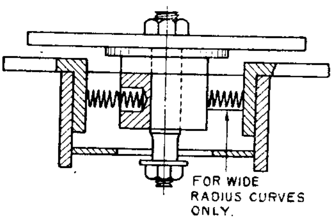
Some builders will want to make a fabricated job of the pony frame, as in full size, and it can be done by the same methods that I described for building up the bogie frame; but quite a number of correspondents said they would much prefer castings, owing to limited spare time, and a wish to get the engine on the road with the minimum of time and labour. To fall in with their wishes, I got in touch with our Scottish friend "Wilwau," who makes all his own patterns; so he can't blame the pattern-maker if his castings aren't O.K.! Incidentally, that native of the land of bagpipes, kilts and haggis can do marvels with a gouge, chisel, and a bit of wood; one of his antics was to make a pattern of an 0-1-1-1-1-0 engine complete with driver—otherwise *a girl on horseback*—and cast a bronze statue off it for the proprietor of a local riding-school. I sent him a tracing of my proposed cast pony-



Bogie pin, sliding block and spacer

truck frame, and asked if it was a practical proposition, as I don't reckon to be an expert on foundry work, and two heads are better than one. I heard nothing for several days, and then his reply came, brief and to the point, in the shape of a nice clean bronze casting exactly to specification He evidently believes in the old saying that "actions speak louder than words"; and as I believe in giving credit where due, I am glad to put the above on record.

It was my original intention to build up the pony frame of my own engine, in the same way as I had built up the rest of the chassis; but there was the pony casting, all-present-and-correct-sergeant, and as my time is precious nowadays, it would have been a sin not to have used it, so I did. By the time these notes appear in print,



How to fit control springs

it is probable that our other approved advertisers will also be able to supply cast pony frames, and they will require very little in the way of machining. The metal of all of them will probably be iron, for the reason that you already know.

As I have a fairly powerful milling machine, all I had to do was to grip the casting upside down in the machine-vice on the table, set it parallel with the cutter arbor, and clean out the axlebox openings with a side-and-face cutter at one fell swoop, so that they couldn't help being the same size, and dead in line. Then the machine-vice was slewed around, the casting turned right way up, and the two $\frac{3}{8}$-in. spring gaps over the axlebox openings cleaned out with a cutter $\frac{3}{8}$ in. wide. The top of the rear member was smoothed off, as the rollers run on it; the hole was drilled for the king-pin, and that was the lot, as far as the actual casting was concerned.

Readers building *Britannia*, who don't possess a milling machine, and can't get the use of one, have nothing to fret about. In fact, if the castings are clean, the axlebox openings, and the spring gaps over them, can be easily smoothed out with a file, and the same humble but indispensible tool will level off the top of the rear frame member. If you haven't a drilling machine, drill the king-pin hole in the lathe, as it must go through squarely. However, the lathe may be used to do the milling, in several ways. If you have a vertical-slide, clamp the casting to it, with the axlebox openings toward the headstock. Packing will be needed between the triangular part and the vertical-slide, to keep the straight edges below the axlebox openings vertical, as they must be at right-angles to the openings. Put a good big end-mill in the three-jaw, adjust vertical-slide for height, and traverse the casting across the end-mill by means of the cross-slide. This will leave sharp corners at the tops of the openings, but that won't matter much. The spring gaps can be end-milled out with a $\frac{3}{8}$-in. end-mill in the chuck, and the casting bolted to the vertical-slide with the axlebox openings facing it, the casting being horizontal, so that the end-mill cuts right along the groove or gap over the openings.

Another way would be, to bolt the casting upside down, parallel to lathe centre line, on the saddle, adjusting the height to allow a side-and-face cutter, on an arbor or mandrel between centres, to clean the sides of the openings at one cut each. The casting would then be reversed, bolted right way up, at right-angles to lathe centre-line, set at correct height for a $\frac{3}{8}$-in. cutter to clean out the gaps for the springs. Any unwanted blobs on the casting could be trimmed off with a file, which could also be used to smooth off the top of the back member.

All being well, in the next instalment I will deal with a built-up pony frame; axleboxes, springs, and wheels are the same for either kind.

A Handy Oiler

S. & B. Productions, 3, Orton Buildings, London, S.E.25, have favoured us with a sample of their new "Dermic" oiler. This is a useful little instrument very similar to a hypodermic syringe; it can be used for delivering controlled and even pre-determined amounts of oil to any part of a small or intricate mechanism.

The device consists of a small glass tubular body fitted with a finger-operated plunger, or piston; each end of the body is capped, the upper cap having the piston-rod protruding through it while the lower one is spigotted for the attachment of a separate nozzle that has a very small bore.

There are two of these nozzles, one straight and the other curved so that it can reach parts that might otherwise be difficult of access. There is also a length of steel wire which can be used either as a guide for the oil or as a cleaner for the nozzles.

The instrument is easy to use and will cope with oil, grease or soldering flux. A printed leaflet of instructions is issued with each oiler, and we believe that there are many ways in which this interesting device will be found very useful.

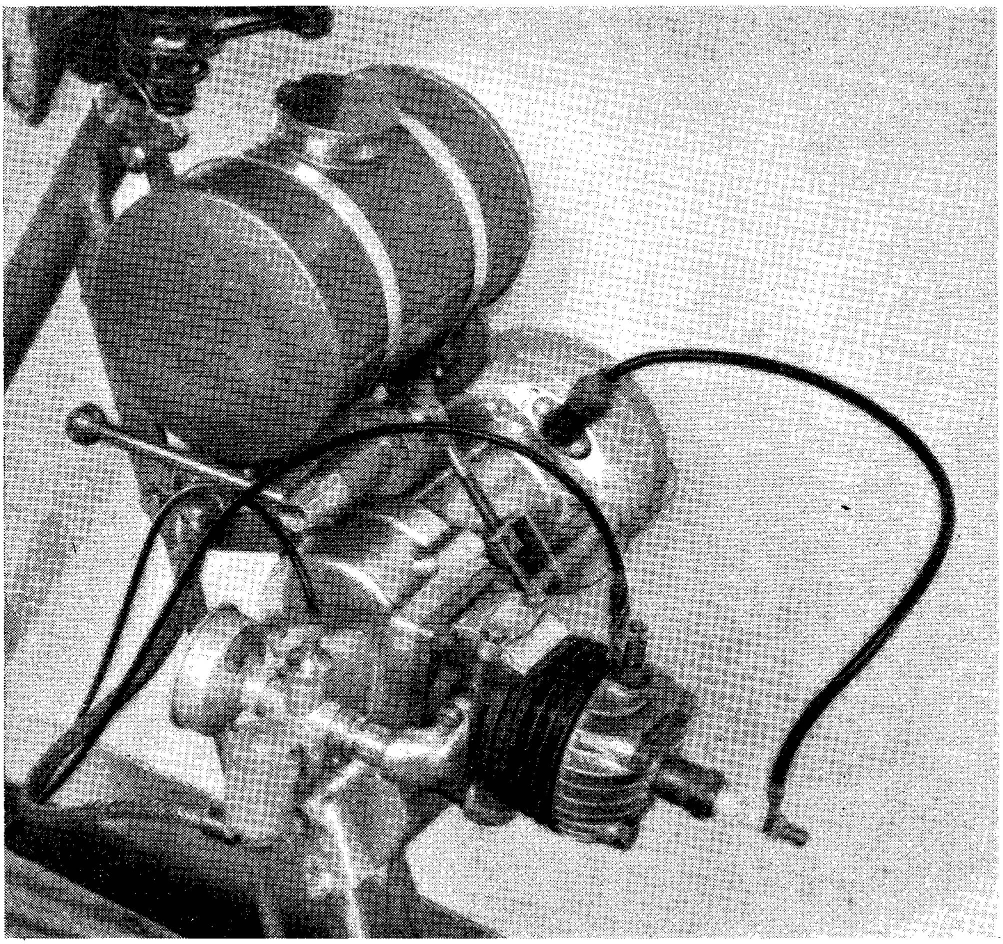
PETROL ENGINE TOPICS

*A 50-c.c. Auxiliary Engine

by Edgar T. Westbury

BEFORE concluding the description of the mounting bracket, it should be pointed out that its assembly is, like all other features of the complete design, capable of considerable variation to suit convenience. In the drawings of the mounting bracket, it is shown with the disengaging gear on the right-hand side, looking from the rear of the cycle ; but in many cases it will be found better to arrange it on the left, where it is well clear of the magneto and other components. This position has been adopted on the example shown in the photograph of the assembly displayed in the showcase of Messrs. Braid Bros. at the " M.E." Exhibition. No difference in the shape or dimensions of the individual components is entailed, but the right-hand mounting plate becomes the left-hand plate, and *vice versa.* Again, it may be found necessary to lengthen the tension bolt to suit certain types of cycles. Should there be a tendency for this bolt to rattle when the gear is in the working position, it may

*Continued from page 367, " M.E.," September 13, 1951.



A complete " Busy Bee " unit attached to cycle frame, as exhibited by Messrs. Braid Bros. at the " M.E." Exhibition

be prevented by fitting a light spring on the bolt, above the stirrup.

Not a Clutch

It is emphasised that the disengaging gear is not under any circumstances intended to serve as a clutch for use while the engine is running. There is a strong temptation to use it in this way, and some types of cycle engine attachments have been fitted with a lifting device actuated by means of a handle-bar clutch lever acting through a Bowden cable. If one could rely on riders *always* using this with intelligence and discretion, the added convenience of such a control would be an undoubted benefit; but in practice it is found that it is very often abused, to the detriment of both the engine and the cycle tyre. Many riders have been known to "rev up" the engine and apply it to the tyre when the cycle is almost or completely at a standstill, with disastrous results to the tread of the tyre. Proper application of the control would demand that the cycle should *invariably* be pedalled away from rest, with the engine ticking over, and the latter engaged when the surface speeds of both friction wheel and tyre were practically synchronised. As such ideal conditions are very difficult to ensure in practice, it will be found just as easy to stop the engine and open the decompressor at each temporary halt, and re-starting in the normal way by pedalling off with the decompressor open, and gradually opening the throttle when a speed of five or six miles an hour has been attained. If the engine is in working order and controls are properly adjusted, it will start easily and certainly every time; only when starting initially from cold is it necessary to use the choke, and very sparingly at that.

I know that many readers will disagree with me about the policy of providing a running control to the disengaging gear, so I will anticipate their criticism by saying, that if they have plenty of money to spend on tyres, I have no objection to their "tearing 'em up" in this way. Incidentally, some riders may find it difficult to manipulate the choke, after starting the engine, without dismounting from the machine; the fitting of a simple control wire is the obvious remedy, and I know of several cases where it has been carried out, though I do not think this facility has been provided on any of the commercial types I have investigated.

Magneto Timing

I have already done penance in sackcloth and ashes for my error in the timing as described in the July 19th issue; where I went wrong was in reckoning the "ignition advance" in the wrong direction, or in other words, retarding it to 25 deg. after top dead centre. Thus I gave the keyway position as 50 deg. from the correct angle relative to the crankpin. I am now showing a diagram which gives the true position of the keyway, looking from the flywheel end of the crankshaft, and trust that this will now clear the matter up.

I may add, in reply to those readers who have asked why it is necessary to set out the timing to odd minutes of a degree, that this is not my affair, as the figures are those given by the makers of the magneto. I agree that it is very difficult to measure angles to such ultra-fine limits, and as a matter of fact, this is only necessary when the cam is formed on the engine shaft. If the cam as supplied by the makers is used, and the flywheel key extended to locate the cam as recommended, the relative timings are automatically synchronised, so that it is quite in order to set out the angle of the keyway to the nearest degree, or even to wider limits, as this only affects spark *timing* (which is not usually very critical) as distinct from spark *efficiency*.

Again, I humbly apologise to those constructors who have been inconvenienced by my error in this matter; I agree with them that there is no excuse for it, though there is quite a lot I could say in explanation of how mistakes do occur on the best regulated drawing boards, and in spite of all the care in the world. "To err is human"—and perhaps an occasional mistake is a blessing in disguise; it keeps me down to earth and serves as a reminder that I am subject to human limitations. Otherwise, I might get the idea that I am infallible—which would be the most disastrous mistake of all!

Design of Accessories

I mentioned at the beginning of these articles that, although the use of a commercially-produced carburettor and magneto was recommended, as a measure of convenience, it is quite possible for the constructor to produce these for himself, and that designs would be forthcoming if a sufficient number of readers were interested. A good deal of correspondence has been received on this matter, though I am not sure whether it is sufficient to justify the work involved in developing these designs. However, there is another factor involved, and one which may seriously influence the success of the engine as a whole—namely, the difficulty of obtaining delivery of commercially-made accessories under the present conditions of restricted supplies. For this reason, it is very desirable that constructors should be enabled to produce these parts for themselves if they so desire.

The Carburettor

With regard to the carburettor, several designs which have been published in THE MODEL ENGINEER in the past could be adapted quite successfully for use on this engine. The "Atom Type R" carburettor, suitably enlarged to give a throat diameter of $\frac{5}{16}$ in., and having a diffuser of the same bore, would give quite satisfactory results, and the "Apex Minor" carburettor, also with its dimensions suitably adjusted, would serve equally well. The latter is the more convenient of the two to adapt for Bowden cable control, as it has a plunger throttle which could easily be modified for operation in the orthodox way. One of my correspondents reports great success with a carburettor of the type described for the "Phoenix" engine, and yet another is using one of the "Seal" type—in each case enlarged and equipped with float feed.

I am at present working on the development of a special carburettor for the "Busy Bee," having the orthodox features as used in motor-cycle practice, but specially adapted to the construc-

tional facilities of the home workshop. This will be described in due course.

In the case of the magneto, things are rather more difficult, as the success of this component depends on the availability of high-efficiency magnet steel, which is very difficult to obtain at present. There is no trouble about producing a satisfactory design, but to publish one without being able to recommend a source of supply for the magnets would only involve me in mountains of fruitless enquiries. It is no use to attempt finding substitutes for the proper magnets, as the success of the modern miniature magneto, whether of the flywheel or any other type, depends entirely on magnets which are anything up to ten times as efficient as those used on the older and more cumbersome machines.

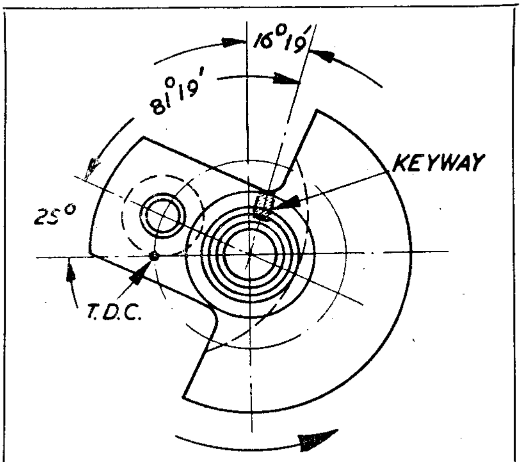


Diagram showing position of magneto keyway relative to crankpin angle, and position of crankpin at the instant of break. (Crankshaft viewed from flywheel end)

The "Atomag Minor" magneto, if properly constructed, will give quite satisfactory results on the "Busy Bee" engine, but it must be exceptionally well protected against damp or other influences which may affect the insulation of the coil. A still better magneto for this purpose is the "Atomax," which has the further advantage, in this particular application, that it could be adapted to supply lighting current as well, by the addition of a second stator unit located opposite the original one, and equipped with a coil of about 500 turns of 25 s.w.g. wire. Both these magnetos are described in THE MODEL ENGINEER handbook *Ignition Equipment*, together with other types which are equally suitable for adaptation to cycle engines.

I have done some preliminary work on a special design of magneto, and this will be described if and when the necessary arrangements for the supply of magnets can be made.

Applications of the "Busy Bee"

Although I have only shown the application of the engine to a cycle, it will be obvious to readers that its use for other purposes calls only for some ingenuity in installation or attachment. Up to the present, my time has been very fully occupied in the development and testing of the engine unit itself, and practical work on its various methods of application has been delayed, but I may be able to show some specific ways of using it at a later date. Among the most popular ideas is that of applying the engine to a lawn mower, and I have had many enquiries as to the best form of drive when it is used in this way. A good deal must necessarily depend on the details of the mower itself, and some of the popular types are so designed that it is difficult to apply any form of drive without structural alteration to the frame and other parts of the machine itself. If, however, these obstacles can be surmounted, there is little difficulty in applying the engine, and I have several ideas which I hope to expound when I have an opportunity of giving them a practical test.

The use of the engine as a marine power unit has also been discussed, and the simplest arrangement would be to use it either as a small "inboard" unit or equip it with a suitable bracket and propeller shaft to attach to the gunwale of a boat as a "sideboard" unit. Most of my correspondents, however, favour its adaptation as an "outboard" engine, but this involves modifications which may be so extensive as to make it easier to produce a completely new design. However, there are some interesting possibilities in this direction which, I assure you, are receiving due consideration. For this, and certain other classes of work, it may be desirable to convert the engine to water cooling, which, unless one is content with makeshift arrangements, involves a re-design of the cylinder barrel and head, and provision for water circulation.

Performance

Many readers have tackled me about this very important question, and have tried to tie me down to a definite statement on figures of horse-power or maximum road speed. But experience has made me very "canny" in committing myself to statements of this kind, not because I have any doubts as to the potential efficiency of the engine, but on account of the varying results which are always obtained by different constructors. It is a very popular fallacy that two engines built to the same "blue print" must necessarily be alike; in practice, they never are, and the amount of variation possible is in some cases astonishing. I usually tell constructors that the engine is "as good as you make it," and this statement, if very vague, is also very true.

Some readers have worked out an estimate of what the engine *ought* to do, based on the figures given for certain small engines, in terms of power output in relation to cylinder capacity, arriving at results which, of course, are fantastic for an engine of this type which neither runs at astronomical speeds, employs high cylinder pressures, nor uses fancy fuel; but on the other hand is required to produce a fairly good torque "low down," and to carry on like the babbling brook, whenever and as long as required to do so.

I will at least say that on actual test, a home-produced "Busy Bee" has maintained a steady $\frac{5}{8}$ horse-power on runs of several hours' duration, and has proved capable of driving a cycle at 18 to 20 miles per hour continuously (which incidentally, is as fast as it is comfortable to ride a push-bike—and much too fast for ordinary cycle brakes!) with moderately good climbing power. Its general structure is robust, and bearing surfaces adequate for the duty for which it is intended. I do not claim it to be the best or most powerful of its kind in the world; it is simply a straightforward conscientious engine intended particularly to suit the constructional facilities of the average amateur. It will, I feel sure, give satisfaction to many constructors by providing an interesting workshop exercise, with the prospect of the additional thrill of achievement, and enjoyment of effortless cycling when it is completed.

One word of advice to intending constructors; if you do not wish to be let down or disappointed over the quality of castings or other components, get them from the *approved* suppliers. I am for ever receiving complaints from readers who have bought castings purporting to be for engines of my design, but find after spending many hours in machining them, that they are unsatisfactory in quality of material, or incorrect in shape or dimensions. It is with regret that I am obliged to tell these readers that I can do nothing to help them in these circumstances. Although I am not connected directly with the production or sale of any engines or castings, it is possible for me to co-operate with certain firms who are willing to accept my advice and criticism, and to submit their products at any time to my inspection. These are the firms I recommend, and with whom I have some powers of negotiation in the event of any complaints being made. With others who market castings and parts without my approval, though they may quote my name in advertising, I cannot exert any influence in this way.

Epilogue

The tale of the "Busy Bee" is now told; the name of this engine symbolises the happy combination of work and pleasure, applying equally to the many constructors who are at present "improving the shining hour"; whose workshop "hives" are now buzzing with activity, and will, in the due course of events, produce results well worthy of their efforts.

STEPHENSON MEMORIAL MINIATURE LOCOMOTIVE ASSOCIATION

Report of Third Annual Trials

THE third Annual Trials of the Stephenson Memorial Miniature Locomotive Association were held on the track of the Tyneside Society of Model and Experimental Engineers in Exhibition Park, Newcastle-upon-Tyne. A total of 17 entries was received consisting of six 5 in. gauge, eight $3\frac{1}{2}$ in. gauge and three $2\frac{1}{2}$ in. gauge locomotives. Before the commencement of the trials one 5 in. and two $3\frac{1}{2}$ in. gauge entries were withdrawn leaving 14 locomotives to compete in the three groups. The weather was excellent throughout the day, in marked contrast to the very trying conditions under which the 1950 event was run, and competitors, friends and public had an enjoyable time.

The order of running was again in gauge groups starting with the heaviest load in 5 in. gauge mainly to minimise the physical labour of the loading crews. Most of the member societies provided officials for the many duties required in an event of this nature, although Tyneside naturally sent the majority in view of their capacity as hosts.

For this year's trials the association adopted a revised version of the 1950 formula, omitting the water factor, and allowing for the use of any special brand of fuel at the competitor's choice. To bring all results to a comparative basis each fuel was analysed for calorific value and the actual consumptions were corrected to a "standard" calorific basis.

..The formula was as follows:

$K = \dfrac{D \times L}{T \times F}$, where K = points scored; D = distance run in feet; L = load hauled in lb.; T = time for run in minutes, and F = weight of fuel used in ounces.

"Standard" fuel was taken as 12,700 B.Th.Us. per pound and "F" in each case was corrected to that basis. Actual calorific values of the various fuels used ranged from 13,200 to 15,200.

Three competitors in the $3\frac{1}{2}$ in. gauge group had to retire during the course of the trials, two on account of damage caused by derailments and one on account of seized motion. The derailments were caused by the wheels of the leading axle of the driving car slowly creeping outwards, so spreading the gauge of the car and causing it to ride up with the flanges on top of the rails, before coming off the track.

Each 5 in. gauge engine had to complete 15 laps of the track—a total distance of 10,500 ft. The corresponding figures for $3\frac{1}{2}$ in. and $2\frac{1}{2}$ in. gauge engines were 10 laps, 7,000 ft. and 6 laps, 4,200 ft. respectively.

The complete list of competitors in order of

Place	Gauge	Owner, Driver and Society	Type	Load Hauled lb.	Average Speed m.p.h.	Fuel Used lb./ton/mile
1st	5 in.	A. W. N. Brown Tees-Side S.M.E. Driver W. H. MacLennan	0-6-0T " Eva May "	3,318	7.95	0.88
2nd	5 in.	J. Hawkes Tees-Side S.M.E. Driver L. Hawkes	4-4-2 N.E.R. " C1 "	2,218	7.92	1.97
3rd	5 in.	W. Longstaff Durham M.E.S.	0-4-0T " Ajax "	1,346	7.7	1.87
4th	5 in.	E. Park Tyneside S.M.E. Driver J. Hall	0-6-0T L.M.S. " 2F "	1,140	5.95	2.77
5th	5 in.	E. Park Tyneside S.M.E.	2-6-4T L.N.E.R. " L1 "	1,012	8.6	4.09
1st	3½ in.	H. W. Evans Tyneside S.M.E. Driver R. Lindsley	0-6-0T Freelance	1,700	7.94	0.995
2nd	3½ in.	H. H. Watson Tyneside S.M.E.	4.6.0 L.M.S. " 5P "	897	6.46	2.36
3rd	3½ in.	A. F. Moon Tees-Side S.M.E.	4-4-0 S.R. " Schools "	654	6.45	4.03
—	3½ in.	N. J. Mellentin Sunderland M.E.S.	2-6-2 " Bantam Cock "	Retired		
—	3½ in.	G. W. Briddick Bishop Auckland S.M.E.	0-4-0T Freelance	Retired		
—	3½ in.	V. M. Lewitt Tyneside S.M.E.	4-4-0 N.E.R. " R1 "	Retired		
1st	2½ in.	J. H. Murta Sunderland M.E.S.	4-4-2 Freelance	537	4.38	2.95
2nd	2½ in.	N. Spark Sunderland M.E.S.	0-6-0 Freelance	476	4.2	2.96
3rd	2½ in.	K. Thomas Tees-Side S.M.E.	2-8-0 " Austere Ada "	445	4.6	3.76

final placing is shown in the table above.

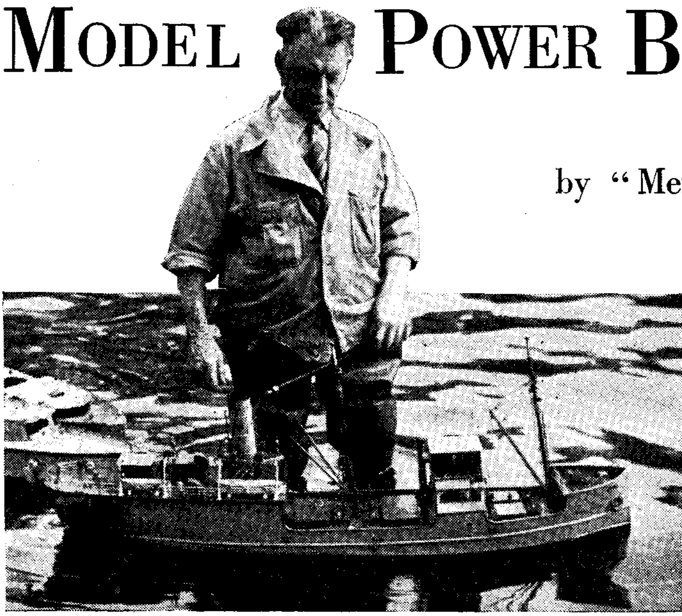
With three exceptions, the average speeds of engines in any one group were very similar. The highest speed of the day was achieved by Mr. Hawkes, whose last lap was actually completed at 11.4 m.p.h. Mr. Park, with the 2-6-4T, had an amazing spell of sustained speed; he did five consecutive laps at exactly 52 sec. per lap = 9.2 m.p.h. for 3,500 ft. continuously.

The phenomenal performances of Mr. Brown's 5 in. gauge *Eva May* and Mr. Evans's 3½ in. free-lance 0-6-0T were again most noticeable in the results.

There is always room for improvement in organisation, and this third Annual Trial was no exception. Similarly, the latest formula is not yet the most suitable for the main object of the association, which is to determine overall efficiency of miniature locomotives. The association again appeals to live steam enthusiasts throughout the country for their views on this subject of comparative testing.

MODEL POWER BOAT NEWS

by "Meridian"



Mr. W. Morss with his well-known steamer "Belle Morss"

THE Steering Competition is a very popular event at most regattas, and recently free-running boats have been taking part in ever increasing numbers. The standard of steering, however, is not as high as it might be, apart from a comparatively few crack boats. At the 1950 Grand Regatta, about 80 steering boats took part, and of these nearly half failed to make a score. In the case of prototype boats with a lot of top hamper: wind and weather may be partly responsible, but even this class of boat *can* win steering events. This has been proved by the performance of such craft as Bill Butler's *Mary Dean* and other fine prototype boats.

The following hints may be of assistance to unlucky competitors with steering boats:—

All single-screw boats tend to veer naturally right or left according to the direction of rotation of the screw propeller; boats having left-handed propellers veer to the right and if right-handed the turn is to the left. *The coarser the pitch of the propeller the greater is the tendency to turn*, and if fitted with a normal type of rudder, the more set-over must be made to keep the boat straight. It follows that if the revolutions of the propeller alter, the boat will tend to turn, following the rudder if the revs drop, or overriding the rudder if the engine should speed up. The fundamental thing is, therefore, to keep propeller revs constant, also fairly fine-pitched propellers are indicated, since if the engine speed drops, say, because of pick-up of weed, the veering effect of the rudder will not be too great, as the set-over necessary with a propeller of this type is reasonably small.

If the boat is fitted with a steam plant, find the maintained working pressure and adjust the rudder to suit—do not be tempted to whack up the pressure before releasing the boat, as a straight course is almost impossible for most boats under these circumstances. In the case of i.c. engined boats the carburettor and ignition settings should be carefully noted, so that as far as possible the engine always runs at the same speed.

Some exponents of steering discard the orthodox type of rudder in favour of two fixed fins placed on either side of the propeller, and this idea works quite well, although in some cases

The Victoria club's petrol-driven cruiser "Silver Foam" running at the West London regatta

Mr. R. O. Porter with his petrol-driven boat "Slickery"

the course steered is not a dead straight line but a slight arc, and this necessitates "aiming off" slightly when releasing the boat. The launch type of boat is, of course, the only hull for these fins, some of which are very large in proportion to a normal rudder.

If a conventional sort of rudder is used, make sure that it extends deep enough to span the arc of the propeller, since shallow rudders are often the cause of erratic steering.

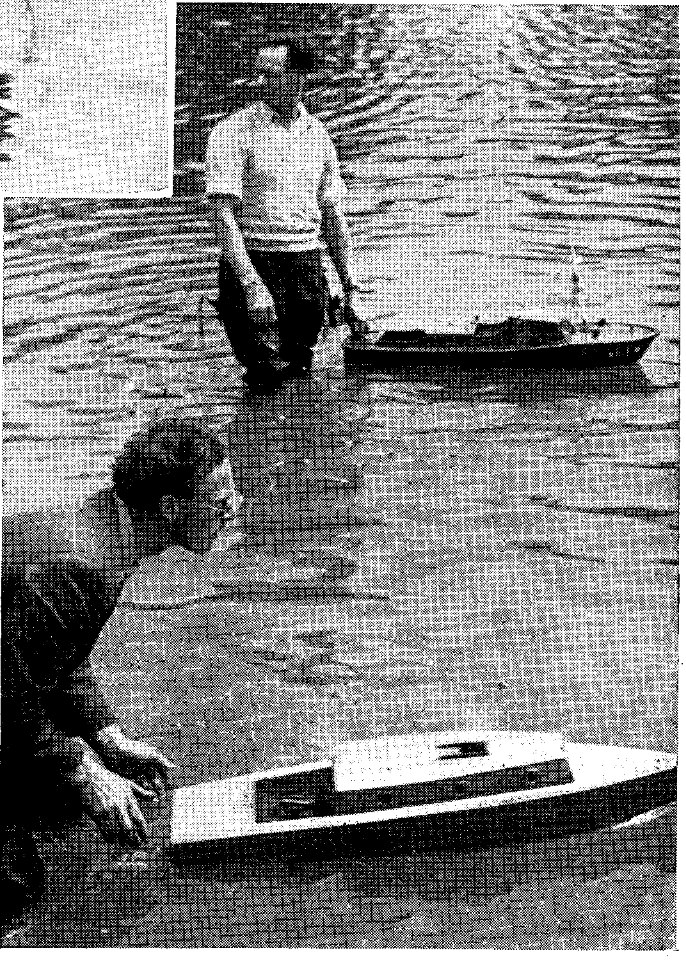
When the boat will steer a straight course under good conditions, experiments can be made when a cross wind is encountered, so that the amount of "windage" to allow in steering events may be known.

The West London Regatta

In spite of the terrors of the Round Pond as a venue for a power boat regatta, quite good support was forthcoming for this event. Due to heavy showers at frequent intervals, only the Nomination and Steering events were held, and the various novelty events which had been planned had to be abandoned. In any case, it had been decided not to hold the famous "Round the Pond" race, as this has been rather too strenuous for the visitors. This regatta is, of course, for straight-running craft only, as hydroplanes are not permitted on the Round Pond.

An interesting new boat taking part was J. B. Skingley's *Josephine* (Victoria), an extremely smart launch, powered with a 4-cylinder "Seal Major" petrol engine.

The Steering Competition was run during stress of the weather, and many boats seemed to prefer the wide open spaces of the Round Pond rather than the targets! The scores were rather low, but several boats had a series of near misses, and, with better luck, the winner's score would have been higher.



Foreground: Mr. J. Benson starting his steam launch "Comet"; background: Mr. Emery with his radio-controlled air-sea rescue launch

Results

Nomination Race 80 *yd.*

1. T. Curtis (Victoria), *Micky* : 3.8 per cent. error.

2. F. Curtis (Kingsmere), *Korongo* : 5.8 per cent. error.

Steering Competition

(Possible points 9).

1. F. Curtis (Kingsmere), *Korongo* : 5 pts.

2. J. B. Skingley (Victoria), *Josephine* : 3 pts.

The Southampton S.M.E. Regatta

This was one that was blessed with fine weather, and an entertaining day was spent at the lake on Southampton Common by many competitors and friends.

There was a strong entry for the Steering and Nomination events, which were both closely contested by some 20 or more boats. The Cheltenham Club were represented by a team of four steering boats and one of these—Mr. Nichol's *Endeavour*—was successful in the Steering and also came third in the Nomination Race. This club is one of those recently affiliated to the M.P.B.A. and has already chalked up successes in various regattas.

For the speed boat men, there was a 1,000 yd race open to all classes, and this was run concurrently with the races for the individual classes. This was achieved by having four timekeepers—two of whom timed for the 1,000 yards.

A new boat by B. Miles (Kingsmere) won the Class " C " race at 56.5 m.p.h. and just managed to beat G. Lines *Sparky* 2 to win the 1,000 yards also.

In the " A " class, the most spectacular boat was B. Pillinor's *Frolic*, a new flash steamer of unusual design, which roared round the course sending a sheet of spray about 10 ft. high ! The spectators, although previously warned, did not seem to mind the free shower-bath in the least.

Results

Nomination Race

1. W. Phillips (Victoria) *Kenvera* : .5 per cent. error.

2. Mr. Dowling (Southampton), *Susan* : 8.7 per cent. error.

3. Mr. Nichols (Cheltenham), *Endeavour* : 9.27 per cent. error.

Steering Competition

1. Mr. Nichols (Cheltenham), *Endeavour* : 13 pts.

2. G. Jones (Victoria), *Regina* : 11 pts.

3. R. Porter (Victoria), *Slickery* : 9 pts.

300 *yd. Class " D " Race*

1. Mr. Hyder (Victoria), *Slipper I* : 31.2 m.p.h.

300 *yd. Class " C " Race*

1. B. Miles (Kingsmere), *Dragonfly* 3 : 56.5 m.p.h.

2. C. Stanworth (Bournville), *Meteor* 2 : 47.2 m.p.h.

300 *yd. " C " Restricted Race*

1. C. E. Stanworth (Bournville), *May* : 52.7 m.p.h.

2. N. Butcher (Victoria), *Day-zee* 2: 49.1 m.p.h.

500 *yd. Class " B " Race*

1. G. Lines (Orpington), *Sparky* 2 : 56.2 m.p.h.

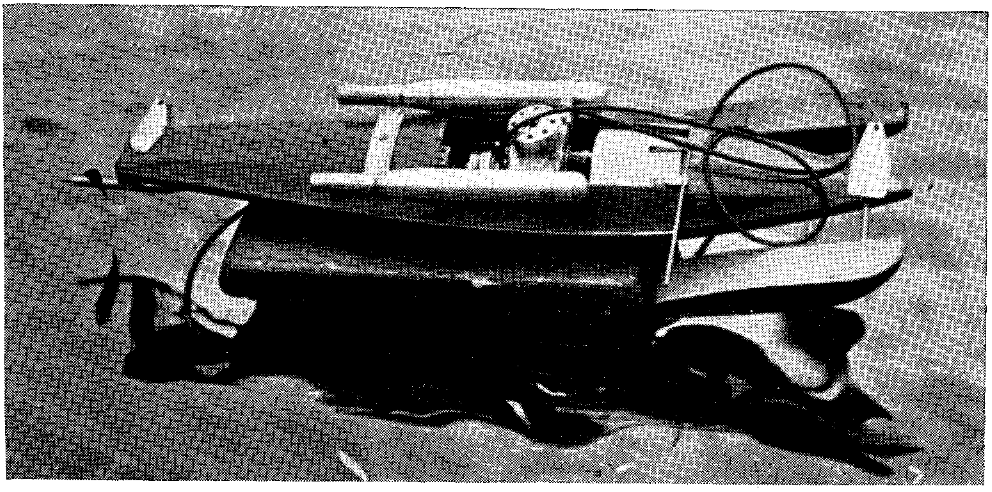
500 *yd. Class " A " Race*

1. E. Walker (Kingsmere), *Boxotrix* : 50.4 m.p.h.

2. K. Williams (Bournville), *Faro* : 45.8 m.p.h.

1,000 *yd. All Classes Race*

1. B. Miles (Kingsmere), *Dragonfly* 3 : 57.2 m.p.h.



Mr. B. Miles' 10-c.c. hydroplane

Novices' Corner

Notes on Riveting

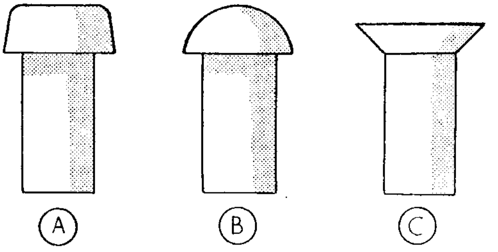


Fig. 1. *Types of rivets*: "*A*"—*pan head*; "*B*"—*round head*; "*C*"—*countersunk-head*

WHEN sheet metal parts and other work of this kind have to be permanently fixed together, riveting if properly carried out will give a neat and secure joint. The actual rivet is made of any of the metals in ordinary use, and a rivet of the same metal as the work-piece is commonly employed. Copper and brass rivets are easily clinched and worked to shape, but for jointing aluminium sheet-material an aluminium rivet should be used.

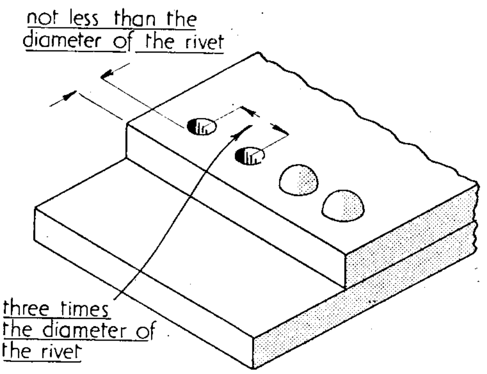


Fig. 2. *Showing how rivets should be spaced*

Iron and steel rivets have, of course, greater strength and are used when forming joints in these materials.

Where a riveted joint is exposed to damp, and especially sea water, it is advisable to employ rivets made of the same metal, in order to avoid corrosion and loosening of the rivets as a result of electrolytic or galvanic action.

Three forms of rivets in common use are illustrated in Fig. 1; *A*—is a pan-head rivet; *B*—the round-head pattern; and *C*—a rivet with countersunk head. In addition, to these, the tinsmith uses a rivet with a flat, mushroom-shaped head, and countersunk rivets are made with heads of several different cone angles.

Preparing the Work

When joining two pieces of plate or sheet material, the position of the rivet holes should first be accurately marked-out as represented in Fig. 2, for a row of irregularly-spaced rivets has a very unsightly appearance.

A line, indicating the distance of the rivets from the edge of the work, can be scribed with the jenny calipers, and the pitch centres are then set off with the dividers.

The two parts to be joined are next drilled so as to form a close fit for the rivets, and all burrs must be removed with a countersink or a scraper to allow the two surfaces to bed closely together. The size of the rivet holes is important, for if as shown in Fig. 3A the hole is too large, the rivet when struck with the hammer will tend to bend instead of expanding to form a tight fit. On the other hand, where, as illustrated in Fig. 3B, the hole is too small, the edge of the hole may shear the sides of the rivet and the head will then be unable to bed properly.

The Riveting Operation

Where a round-head rivet is employed, the tail of the rivet can be clinched in either of the two ways illustrated in Fig. 4. To form the rounded clinch, shown in Fig. 4A, the three tools illustrated in Fig. 5 are commonly used. After the rivet has been inserted, the tool *C* is gripped in the vice so as to form a support for the head of the rivet during the clinching operation, and as the recess in the tool corresponds with the curvature of the head, the surface of the rivet will not be damaged.

It may, however, be found that a flat aluminium block will serve for supporting a copper rivet in this way without deforming the head. Next, as shown in Fig. 6A, the closing tool *A* is used to seat the work on the rivet, and the tail of the rivet is then struck a few well-controlled, firm blows with the hammer to expand the

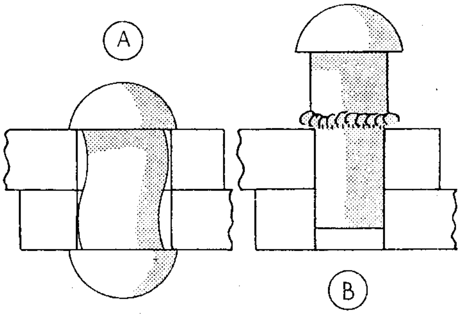


Fig. 3. *Rivet holes*: "*A*"—*hole too large*; "*B*"—*hole too small*

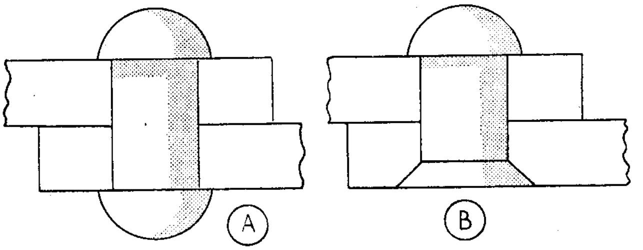


Fig. 4. "A"—round-head rivet finished with a round head; "B" similar—rivet clinched with countersunk head

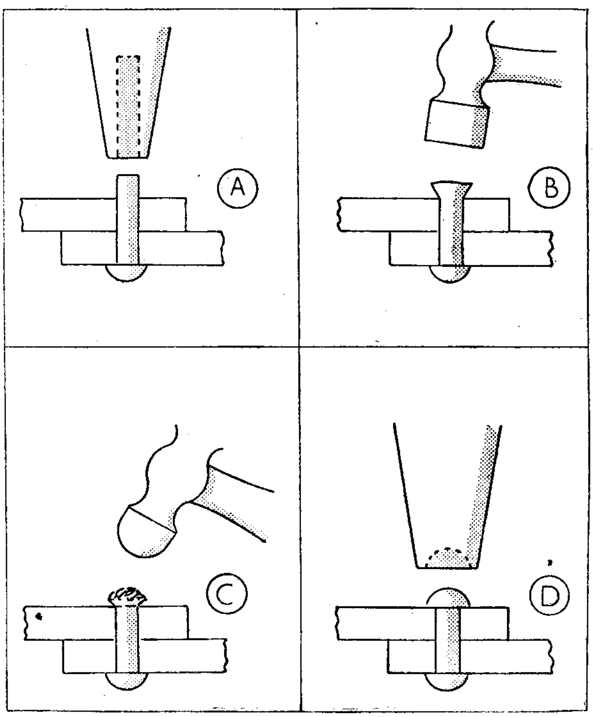
rivet shank in the hole and, at the same time, the new head is set up. When shaping the head with the ball-pein of the hammer, as shown in Fig. 6C, it is important to avoid giving a number of very light blows, as this will tend to loosen the rivet. Moreover too much hammering is apt to harden the rivet and lead to splitting of the newly-formed head. Finally, with the work still supported on the tool *C*, the rivet head is finished to shape by hammering down the rivet set, tool *B*, as represented in Fig. 6D.

Where a neat finish is required, the tail of the rivet can be shaped to lie flush with the work surface, as shown in Fig. 4B.

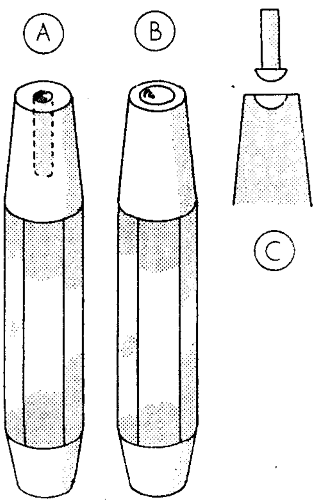
When riveting in this manner, the underside of the work is first lightly countersunk; too deep a countersink will, however, entail an unnecessary amount of hammering to expand the rivet fully. After the rivet has been firmly clinched, the new head is carefully filed flush and the rivet seating should then be almost invisible. To give the rivet a flush seating on both surfaces of the work, as shown in Fig. 7, a countersunk-head rivet is used and the work is also countersunk on both sides. During the clinching operation, the rivet head is supported on a flat metal block, and the tail of the rivet is finished as in the previous example. The same method can also be used for fixing short shafts or other fittings in place in the way illustrated in Fig. 8. The end of the shaft is first turned to a light press-fit in the hole drilled in the work, and the end of the spigot is then hammered over so as to fill the shallow countersink formed at the mouth of the hole. When securing components in this way, it is essential that the two parts should first be fitted closely together and, for this purpose, direct pressure applied in the vice will usually be found more effective than using the hammer.

Finally, it should be pointed out that, during clinching, the rivet must always be placed on an unyielding support, for, if the rivet can spring away from the hammer, the difficulty of closing the rivet firmly on the work will then be greatly increased.

Right. Fig. 6.—Riveting: "A"—closing the work; "B"—expanding the rivet; "C"—forming the head; "D"—finishing the head



Below—Fig. 5. Riveting tools: "A"—Closing tool; "B"—rivet set; "C"—tool for supporting the rivet



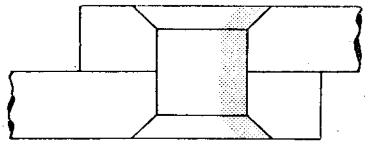


Fig. 7. Parts joined with a flush-fitting rivet

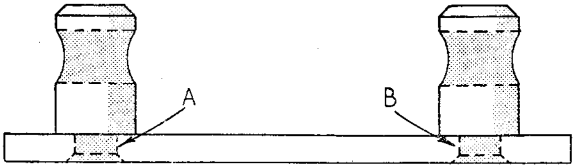


Fig. 8. Flush-riveting parts in a bar

Riveting Aluminium

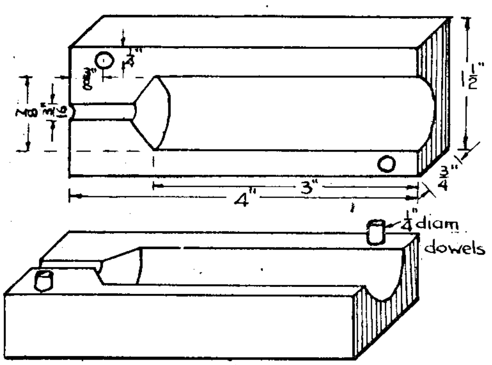
Owing to the ductility of this material, great care must be taken when making a riveted joint, as excessive hammering will expand and distort the metal, thus producing a wavy edge and possibly a crinkled surface at the joint.

Apart from the skilful use of the hammer, this trouble is less likely to occur if the line of the rivets is set well back from the edge of the joint, and the rivets are not pitched so closely that hammering becomes difficult. While the rivets are being clinched, the expansion of the aluminium sheet may throw the drill holes in the two parts out of register, and to counteract this it is advisable to vary the order of setting the rivets and to fill the intervening spaces later, rather than to start at one end of the work and close the rivets in regular sequence.

A Screwdriver With a Cast Handle

THE job to be described in the following notes, not only results in a useful tool, but also shows how the scope of the average workshop may be increased.

The first thing is to make the mould in which the handle will be cast. This is formed from two pieces of $1\frac{1}{2}$-in. × $\frac{3}{4}$-in. bright mild-steel. They are cut to a length of 4 in. and the ends squared, either by filing or facing in the lathe.



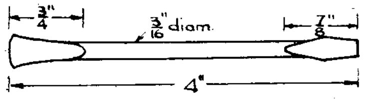
Detail of mould

They are then clamped together face to face, and held by two large toolmaker's clamps, while the side of one is marked out for drilling the $\frac{1}{4}$-in. dowel holes. These holes should go right through one piece and about half-way through the other. Dowels are then inserted and the whole thing mounted in the lathe four-jaw chuck and carefully centred. They are then drilled right through with a $\frac{3}{16}$-in. drill, the hole forming one half of itself in each piece. An extra long drill will be required for this purpose, or alternatively, if the setting up is done accurately, the drilling may be done from either end. The hole should then be opened out to $\frac{7}{8}$ in. diameter for a depth of 3 in.

The screwdriver blade is made from a 4 in. length of silver-steel, each end of which is heated to redness and flattened out, one end being subsequently filed or ground to form a driver end. The other end acting as a key within the handle.

Material for casting may be any scrap aluminium, although old motor-car pistons appear to contain the most tractable metal. If the mixture is of an uncertain quality a small percentage of zinc, will generally assist the machining qualities of the resulting casting.

To make the screwdriver, place the blade in position in the mould and fasten a G-cramp over the centre of the mould to keep it closed, then heat it to a temperature of about 200° C. This is about the melting point of soft-solder. This may be done in a fire or over a gas ring. And in the meantime, melt the aluminium in a ladle.



The blade

When molten, pour it steadily into the mould which has been transferred to a vice.

Allow to cool, remove the mould and machine the handle to the desired shape in the lathe. If a hexagonal handle is desired, it may be machined on the shaper or in the lathe, using an index and racking the tool back and forward along the bed. If the facilities are available, the mould may be made larger and a thicker sectioned blade used.—A. SMITH.

A MODEL WOOLCOMBING MACHINE

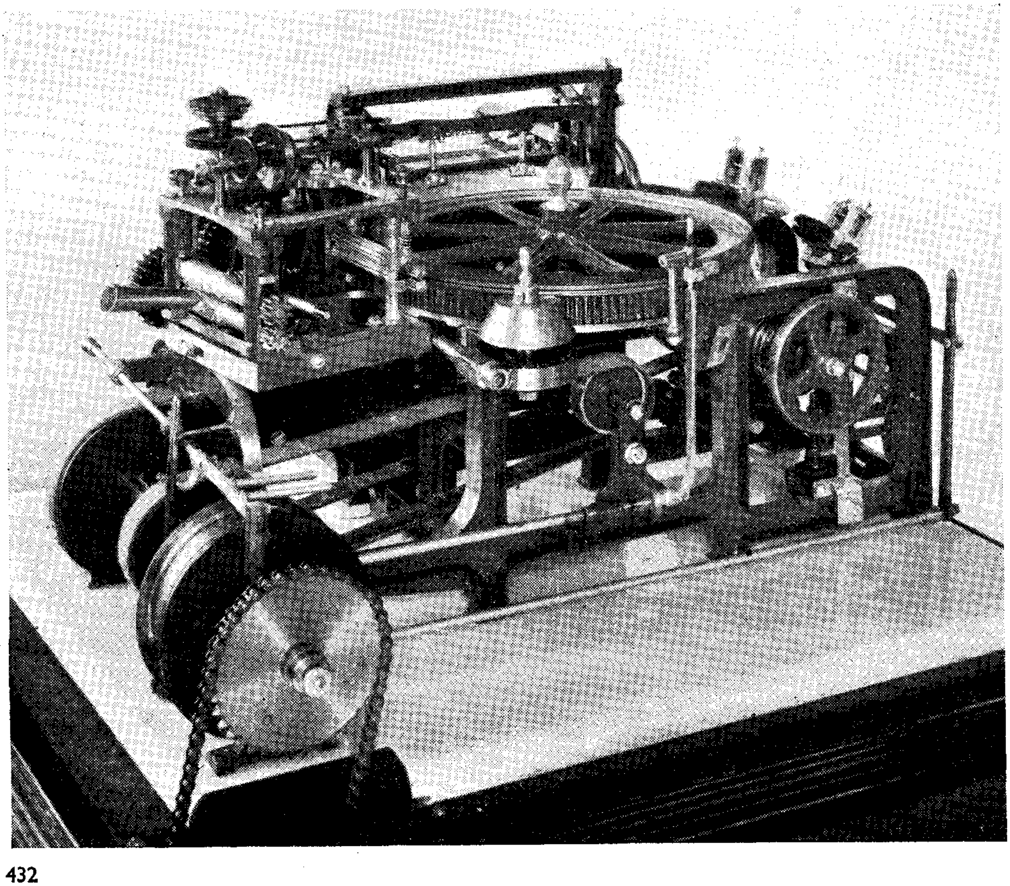
A WORKING model woolcombing machine, probably the only one of its kind in existence, is now a popular exhibit with visitors to the Cartwright Memorial Hall Museum, Bradford.

Details of its origin are obscure, but it is a model of an early type of machine woolcomb invented by the late Samuel Cunliffe Lister, first Baron Masham, who founded the large textile firm of Lister and Co. Ltd., Manningham Mills, Bradford, and who built the Cartwright Memorial Hall in memory of Dr. Edmund Cartwright, another early inventor of textile machinery.

The model embodies a number of unusual mechanical movements, but although it was acquired by the museum in 1907 these have not been visible through the model being static. Last year Mr. Harry Jackson, of Cullingworth, Bingley, spent four months cleaning, repairing and rebuilding it, and it is now fitted with a handle so that visitors can set it in motion.

Brief explanatory notes tell how the combing process separates the short wool fibres from the long, the short fibres being subsequently used for woollen cloth and the long for worsted cloth. There are also photographs of modern woolcombs, supplied by Messrs. Prince Smith and Stells, Ltd., Keighley.

This interesting model is representative of a type which is unfortunately only too rarely encountered. Such machines as this give a glimpse of the world of ingenuity which has been devoted to the development of industrial machinery, and textile machines in particular. The industry of this country has been largely built up by the endeavours of innumerable inventors who have enabled processes which were formerly slow and laborious to be improved and speeded up, thereby bringing manufactured products within the reach of all classes of the community. Models of these machines can do much to bring home to the general public the importance of British industrial engineers, and we commend them to the notice of constructors who are looking for "something different" as an outlet for their creative talents.



PRACTICAL LETTERS

Rust Prevention

DEAR SIR,—Referring to Mr. G. Struan Marshall's letter in the issue of August, 9th I think that Jenolite is about the best medium for the prevention of rust on tools and workshop equipment, or anything else of iron or steel. All one need do is to dab on a little of the stuff with a cloth or brush two or three times a year and leave it there. Between whiles, the tools can be oiled if desired as an additional precaution. It must be emphasised that Jenolite is not a paint, but a watery and almost colourless liquid; it will not make any difference to the appearance or feel of tools, provided that no rust was present when it was applied. If a coating of rust has already formed, the Jenolite will make very short work of it.

I always use it on iron or steel which is to be painted. It will bond the paint to the metal much more securely than would be possible with untreated metal.

Needless to say, I have no interest whatever in Jenolite, other than as a satisfied user.

Yours faithfully,

London, W.1. JOHN H. AHERN.

"Twin Sisters"

DEAR SIR,—Replying to the criticisms of Mr. R. M. Evans, on the above, I would like to satisfy him and, perhaps, other readers on the points he makes.

The apparently useless projection on the underside of the big-end of the eccentric-rod is a provision made for an oil-pad, the plug being a means of access to it.

There is a similar provision made on the big-end of the connecting-rod, and which seems to have escaped the enquirer's attention. If he cares to study the official works drawings of this locomotive, he will find both these features plainly shown.

Any why not stainless-steel for crank-pins and eccentric-rod pins? Having specified stainless-steel throughout the locomotive, there seems to be no point in turning to another material that cannot offer better wearing properties; I would go further to assert that, in many ways, stainless-steel is superior to silver-steel, used in the un-hardened state, but I do not *preclude* the use of other steels—I merely recommend materials that have proved to be satisfactory in the course of my own long experience.

I find that eccentric-rod pins (presumably, return-crank pins), screwed and silver-soldered, make a neat and permanent job; pins screwed *only*, might tend to unscrew on the right-hand side of the engine, and pressed-fit pins are satisfactory only when the length of the hole accepting the pin is one and a half times its diameter. Burring or spreading over of the pin at the back, whether it be plain or screwed, has no disadvantages as far as I know, and builders can either accept my recommendations or fall back on their own ideas.

And now, having agreed upon the desirability of having the position of the return crank made positive, and to which I would add, correct positionally, I am trying hard to find out where the "laborious" part comes in.

The making of the tiny jig—more or less a kindergarten job, can be dismissed in a matter of minutes, whilst the actual use of the jig in determining the correct setting of the return crank, during the drilling operation, can further be dismissed in a matter of *seconds.*

If these operations have been carried out with reasonable care, the holes drilled and tapped, and studs made to *fit* the mating components, I cannot, for the life of me, see where any possible variation can take place. After many years of using this method, I have never found slop, variation of valve setting, or any kind of failure, occur—which frankly, satisfies me, and gives me good reasons for recommending the procedure to other locomotive men.

The taper-pin and clamping-bolt methods are widely used, and appear to give satisfaction, but it so happens that neither of these features is correct for the type of locomotive being described. The very terms "arriving at" suggests to me a process of trial and error; I prefer to deal with the problem with some prior knowledge of the required position, and a simple appliance to ensure that position being found with the minimum of time, trouble, and hours of experimenting.

Yours faithfully,

Worthing. J. I. AUSTEN-WALTON.

Steam Engine Design

DEAR SIR,—Although I like to see a steam engine in THE MODEL ENGINEER, the one on page 231 (August 23rd) is unusual; in fact, it annoys me. In an engine that will only run one way due to the pump it drives, the crosshead thrust should be against the guide, not pulling against the keep plates.

Yours faithfully,

Shipley. FRANK D. WOODALL.

Steam Ploughing Tackle

DEAR SIR,—I note with interest that Messrs. Bomford & Evershed, Rolling & Ploughing Contractors of Salford Priors, Nr. Evesham, and near the Worcestershire-Warwickshire boundary line, have several sets of Fowler, and other engines in their yard, and if Mr. Hughes is interested, I suggest he makes a journey there, as a new roadway is being constructed to the yard and maybe they are shortly to be scrapped. The licences indicate they were used up to last year, but I note a number of new diesel types at the workshops.

The above lie on the main road between Evesham and Stratford-on-Avon, and within a few feet of same, being plainly visible alongside the railway bridge and line.

Yours faithfully,

Usk. E. DEVETT SAGE.